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# USSR Report

CHEMISTRY

No. 92

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## ANALYTICAL CHEMISTRY

UDC 551.464(865-16):546.18-027.32

### MEASURING COSMOGENOUS PHOSPHORUS-32 IN SEA WATER

Leningrad *RADIOKHIMIYA* in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 2 Jun 81) pp 397-399

MERKUSHOV, A. V., SAPOZHNIKOV, Yu. A. and NESMEYANOV, An. N.

[Abstract] Cosmogenous phosphorus isotopes  $^{32}\text{P}$  and  $^{33}\text{P}$  form chiefly through the reaction of cosmic radiation with nuclei of atmospheric argon and can be used as tracers in studying atmospheric processes. As some of these cosmogenous radionuclides are removed from the atmosphere and deposited in the oceans, the authors sought to determine concentrations of the title isotope in upper layers of Pacific Ocean waters near the Kurile Islands, in samples collected in July-August 1980. It was anticipated that  $^{32}\text{P}$  would be found with stable phosphorus orthophosphates. Test samples from which a magnesium-ammonium phosphate were precipitated and phosphorus isotopes separated showed less than half the expected quantities of  $^{32}\text{P}$ . The authors explain this variation by the rapid absorption of phosphorus by "hydrobionts," so that dissolved and suspended organic phosphorus is found instead. The season and precise location in the ocean also affect  $^{32}\text{P}$  quantities. The meteorological conditions and the real rate of vertical movement in upper ocean layers are also involved. References 10: 7 Russian, 3 Western.  
[291-12131]

UDC 678.741:662.613.5

### SMOKE FORMATION CAPACITY OF ELECTRIC INSULATION MATERIALS

Moscow *PLASTICHESKIYE MASSY* in Russian No 7, Jul 82 pp 48-49

OVECHKINA, G. I., GORDON, A. L., OVECHKIN, P. L., DIKERMANN, D. N.,  
NOVIKOV, V. K., FINKEL', E. E. and NOVIKOV, G. V.

[Abstract] Materials based on polyolefins and PVC as well as fluoropolymers are used in producing cables. Thorough evaluation of their fire danger



includes smoke formation, the topic of the present study. The authors studied both burning and smoldering characteristics by the Aminco NBS optical method and a gravimetric method which determined the mass of the smoke produced. The test compositions were high and low pressure polyethylene, ethylene-alpha-butylene copolymers, vinylacetate and various thermally stabilized compositions based on high pressure polyethylene. Results showed that homo- and copolymers of ethylene emitted relatively little smoke when burning, but considerably more when smoldering; the copolymer with vinylacetate had the least smoking capacity. Thermally stabilized high pressure polyethylene also emitted significantly less smoke while burning than while smoldering. Halide antipyrines had previously been shown to produce large amounts of smoke. The best performance in terms of low smoke production came with fluoroplastics F-2M and F-4MB. Figure 1, references 3 (English).  
[302-12131]

## CATALYSIS

UDC 678.044.66

### INVESTIGATION OF PRODUCTS FROM CATALYTIC TRANSFORMATION OF PHENYLISOCYANATE

Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR, SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 7, Jul 82  
(manuscript received 16 Mar 82) pp 34-38

BAKALO, L. A., LIPATOVA, T. E., KHRAMOVA, T. S. and BORISOVA, S. V.,  
Institute of Organic Chemistry, Ukrainian SSR Academy of Sciences

[Abstract] IR and NMR spectroscopies were employed in following the reaction of phenylisocyanate with triethyleneglycol in chlorobenzene or methylethylketone, solvents with different solvating properties, in the presence of sodium acetate catalyst. The results indicated that, when the ratio NCO/OH equals 2, the reactions proceed in two stages and that the effects of the catalyst are equivalent in the second stage for the two solvent systems. In chlorobenzene the composition of the products was 19% diurethane, 26.7% allophanate, 16.3% urethane-isocyanate adduct, and 38.9% triisocyanurate. In methylethylketone the major product was the urethane-isocyanate adduct (59.3%), while the yield of triphenylisocyanurate did not exceed 1%. Figures 2; references 5: 1 Western, 4 Russian.  
[317-12172]

UDC 665.658.2.001:665.772

### HYDROPURIFICATION OF SOLID PARAFFINS WITH NICKEL-CONTAINING CATALYST

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 7, Jul 82 pp 11-12

USHATINSKAYA, O. P., BADYSHTOVA, K. M., SHABALINA, T. N. and NAZAROV, V. I.,  
Kazan Branch, All-Union Scientific Research Institute for Petroleum Production

[Abstract] Solid paraffins used in foods should not contain polycyclic aromatic hydrocarbons (PAU). Selection catalytic hydrogenation of these and some resins was tested by the authors using nickel on diatomaceous earth under laboratory conditions. The process was aimed at hydroconversion of

impurities without modifying physicochemical properties of the initial paraffin. It was conducted at 180-280°C with hydrogen-containing gas circulation at 800-1400 m<sup>3</sup>/m<sup>3</sup>, feed at 0.5-2.0 h<sup>-1</sup> and pressure of 2-4 MPa. Effects, measured on the basis of PAU content, color, change in oil content and depth of desulfurization, showed complete hydrogenation of the PAU at 220-260°C, pressure of 4 MPa, circulation frequency of 1100-1400 m<sup>3</sup>/m<sup>3</sup> and feed of raw material of 0.5-2.00 h<sup>-1</sup>. Sulfur content was reduced and color improved, and polycyclic aromatic hydrocarbon content did not exceed 0.0001% by weight. Figures 2; references 4 (Russian).  
[298-12131]

## CHEMICAL INDUSTRY

UDC 631.8

### TASKS OF 11th FIVE-YEAR PLAN

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 3-4

KOLOMAZOV, B. I., Deputy Minister for Mineral Fertilizer Production

[Abstract] Citing the basic goals of increasing fertilizer production and assuring raw materials for such advances, the author summarizes the volume of production of chemical means of plant protection. He lists new nitrogen production facilities at the "Pridon" Chemical Plant, phosphorus production increases at the Meleuzov Chemical Plant, and increased "lenacyl" output at the Ufa "Khimprom" production association. The completed Togliatti-Odessa ammonium pipeline promises greatly expanded deliveries of liquid ammonia for agriculture, and other advances are also being made by organizations related to the Ministry. Granulated solid nitrogen and phosphorus fertilizers with anti-caking additives are available in increasing volume. A major need is to provide sufficient, appropriate rail cars to ship these products, along with better packing and storage.

[297-12131]

### DEVELOPMENT OF POLYMERIZED PLASTIC PRODUCTION DURING 11th FIVE-YEAR PLAN

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 82 pp 3-5

SAZHIN, B. I., POPOVA, I. N. and SAVVINA, Ye. A.

[Abstract] The authors review advances in production of polystyrene, polyvinylchloride polyolefins, high and low pressure polyethylene and other plastic polymers with emphasis on monetary and raw material savings resulting from their substitution for non-ferrous metals and other natural materials. Plans for the 11th Five-Year Plan include producing 85% of low pressure polyethylene by a gas-phase method and 15% by liquid phase, increasing polypropylene production 4.4-fold and polystyrene 2.3-fold, and similar increases in other polymers as new plants come into production. Product mix is also to be improved. Considerable significance is given to the production of filled and polymer-polymer compositional materials, such as

ABS-PVC combinations, fiberglass-filled polypropylene, and fiber-filled and high-dispersion mineral compositions with polypropylene. Copolymers of ethylene with propylene, alphabutylene, vinylacetate, high-molecular polyethylene, block propylene copolymers and MSP plastics will be produced in industrial quantities for the first time. A major direction during the period will be to improve quality throughout the product mix. Along with general plant expansion and improved efficiency, some directions for development include simplified polypropylene production using new catalysts, production of polystyrenes through a latex-suspension method, and improvement of environmental protection with low-waste and closed systems. Since planned levels of production cannot be attained in the European part of the USSR, plants in western Siberia and Kazakhstan will carry much of the load.  
[302-12131]

#### PROSPECTS FOR DEVELOPING LATEX TECHNOLOGY

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82 pp 2-3

CHERNAYA, V. V., Scientific Research Institute for Resins

[Abstract] Since the first mass production of latex articles in the late 1950s, that branch of rubber production has grown into an independent sector of the Soviet economy, providing synthetic sponges, protective gloves, elastic threads and numerous medical and hygienic supplies. Yet demand still exceeds supply. The 11th Five-Year Plan will seek to close the gap with domestic raw materials such as butadiene-styrene latex, 1,4-cis-polyisoprene, and butadiene-nitrile carboxylate latex. Latex production requires different stabilizers, dispersing agents, thickeners and powdering devices than those employed in other resin production, and a major problem is in manufacturing highly specialized goods in an economically feasible way. Modern equipment and human amenities are necessary at production plants. Further, labor-intensive production must be modified to allow more automation. Workers must be protected from injury from corrosive environments, and production efficiency and utilization of natural resources must be improved. An advance in this direction involves re-use of foam resin in producing sponges and latex products. Compositions based on latex, such as the "Polan-M" coating to protect large steel installations from corrosion, are currently being produced in the USSR. Greater economies are expected as new uses for latex are found.  
[292-12131]

## COMBUSTION

UDC 662.992.8(088.8)

### DEVICE FOR EXPRESS ANALYSIS OF FLASH POINT OF PETROLEUM PRODUCTS

Moscow KHIMIYA I TEKHNOLOGIYA TOPLIV I MASEL in Russian No 7, Jul 82 pp 42-43

RUDOY, I. N., PESHCHENKO, A. D., SACHEK, A. I. and BOL'SHAKOV, G. F.,  
Belorussian State University imeni V. I. Lenin

[Abstract] The authors previously described (this journal No 10, Oct 81) a device for automatically determining the flash point of petroleum products in an open crucible. They have modified it by adding a control device and movable baffle to isolate a test charge. The operation of the system is summarized. The recording device has an automatic shutoff, and feed control prevents unintentional burning of a test sample. Labor productivity and accuracy are improved, and fire danger reduced, by the device. Figure 1; references 2 (Russian).

[298-12131]



## FERTILIZERS

UDC 631.893.123+636.087,74

### DEVELOPING A PROCESS FOR PRODUCING ANIMAL FEEDS AND MIXED FERTILIZERS CONTAINING CARBAMIDES

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 343-346

SARBAYEV, A. N., POLYAKOVA, Z. A. and KORYAKIN, A. G.

[Abstract] Development and rapid introduction of new types and forms of combined fertilizers and animal feeds have great significance for the national economy. The present study relates to technical research of intermediate stages in experimental and test production of fertilizers, with specific attention directed at improving technology in the stage of neutralizing the carbamide-containing melt with phosphoric acids. Experimental data indicated that the neutralization process tested was complete in 5 minutes; longer reaction time brought a change in product composition due to carbamide hydrolysis. The test process, which produced 500 kg/hour, was accompanied by considerable heat, requiring corresponding adjustments to the apparatus. The design of the final apparatus is portrayed. The experimental equipment successfully performed in production tests, and is recommended for producing fertilizers and animal feeds. Figures 2; references 2 (Russian).

[288-12131]

UDC 631.893:661.635.213

### PHYSICO-CHEMICAL BASES OF TECHNOLOGY FOR NON-CAKING MIXED FERTILIZERS CONTAINING MONOAMMONIUM PHOSPHATE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 346-348

BORISOV, V. M., AZHIKINA, Yu. V., MASLENNIKOV, B. M., KAPILEVICH, S. B.,  
GERKE, L. S. and BRODSKIY, A. A.

[Abstract] No significant production of "carboammophos" or "carboammophoska" fertilizers [hygroscopic and readily-caking products] has taken place in the

USSR due to technical deficiencies in their production relating to their undesirable properties. The authors present results of research into the title process, and describe the production of the initial monoammonium phosphate and subsequent steps. Reverse neutralization from pH = 8.0 into low pH values reduced viscosity to a point below that found in direct ammoniation. Guided crystallization of ammophos is central to producing non-caking fertilizers. The crystals produced are coated with an amorphous impurity that enhances granulation of the final product. The equipment for production is simple and low in cost, yet highly effective and durable in its operation. Figures 3; references 4: 2 Russian, 2 Western.  
[288-12131]

UDC 661.717.5-965.1.002.237

#### HARDENING GRANULATED CARBAMIDE WITH SODIUM POLYPHOSPHATE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 351-353

KUZ'MENKOV, M. I., PECHKOVSKIY, V. V., IVANOV, V. A., IL'YASHENKO, A. P., SHIROKOV, S. G. and SEDACH, M. P.

[Abstract] Ammonium sulfates and polysulfates tested as hardeners for carbamide were insufficiently effective. Sodium polyphosphate  $\text{Na}_n\text{H}_{2n}\text{P}_{n+1}\text{O}_{3n+1}$  was expected to prove a promising alternative, and the authors studied its hardening effect on carbamide granules, using electron microscopy in a special method that is summarized. Analysis of data obtained showed that sodium polyphosphate reduced the crystallization temperature of carbamide and was a highly effective hardening additive. The carbamide shop of the "Azot" Association in Grodnensk did the pilot trials, using sodium polyphosphate from the Perm' Chemical Plant. Production tests confirmed the experimental results, and full production applications are being implemented. Figures 3; references 5 (Russian).  
[288-12131]

UDC 633.18:631.816.12

#### INCREASING YIELDS AND VIABILITY OF RICE SEEDS BY USE OF NITROGEN, PHOSPHORUS AND POTASSIUM FERTILIZERS

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 19-20

UKRAINSKIY, Yu. G., "Sovetskaya Rossiya" Collective Farm, Krasnodar Kray, OVCHINNIKOVA, V. A., BELOZEROV, V. A., and KRASNOOK, N. P., doctor of biological sciences, Krasnodar Polytechnical Institute

[Abstract] Current practice is to increase planting density of rice to achieve acceptable density. The present study gives results of field tests

in 1978 and 1979 with the title fertilizer components at the "Sovetskaya Rossiya" collective farm. 150 kg/hectare of nitrogen, 30 kg/ha of phosphorus and 40 kg/ha of potassium were administered separately and in combinations of nitrogen and potassium or nitrogen and phosphorus. Results showed that the highest increases came when nitrogen fertilizers were given prior to tillering and again prior to blossoming. The first application enhanced shoot formation, thus increasing crop density, while fertilizing before blossoming lengthened the time during which the grains filled out. Fertilizing with potassium and phosphorus had little effect, but under low temperature conditions, both nitrogen and potassium, particularly the latter, were beneficial. References 3 (Russian).  
[297-12131]

UDC 631.81

#### BIOLOGICAL EFFECTIVENESS OF CHEMICAL SUBSTANCES IN GRAIN PRODUCTION

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 53-56

IGNAT'YEV, A. D., doctor of medical sciences, CHAKHOVSKIY, I. A., candidate of medical sciences and KORNEYEVA, N. A., All-Union Institute for Experimental Veterinary Medicine, Minsk Medical Institute, and Central Experimental Laboratory for Chemization, USSR Ministry of Agriculture

[Abstract] In monitoring grain quality, using white mice, chicks and infusoria as test subjects on the one hand, and chemical methods on the other, the authors found that results frequently varied, especially in terms of protein content. They hypothesized that factors ranging from enzyme inhibitors to unfavorable combinations of highly active nutrients could be involved. In the present study they sought to differentiate between the beneficial portion of accumulated protein and the total protein content. They developed a method of calculating "pure" protein retention in laboratory animals on the basis of a coefficient of protein effectiveness, which can be determined simultaneously with the previously used coefficient of feed effectiveness. The method was tested on white male rats that were fed wheat samples that had received natural fertilizer, NPK or NPK+natural fertilizer. Results showed that while the biopotential of wheat receiving manure rose 21%, grain protein content increased only 6%. With NPK and manure similar results were obtained, but mineral fertilizer alone raised the parameters in the opposite manner: while protein content increased 18%, actual biopotential exceeded the control grain by only 6.8%. Thus the test method was regarded as a more effective measure of true economic benefits from fertilizers. References 23 (Russian).  
[297-12131]

# SIGNIFICANCE OF INCREASED NITROGEN/PHOSPHORUS NUTRITION IN ALLEVIATION OF CHLORINE TOXICITY (IN POTASSIUM SALT) ON YIELD AND BIOLOGICAL VALUE OF POTATO TUBERS

Moscow AGROKHIMIYA in Russian No 6, Jun 82 (manuscript received 14 Apr. 81)  
pp 68-72

KULIKOV, Ya. K., IVANOV, N. P. and MEDVEDEV, A. G., Belorussian State University, Minsk

[Abstract] Studies were conducted on the effects of various levels of nitrogen/phosphorus fertilizers on yield, protein content, and amino acid composition of Zazerskiy potatoes grown on dernovo-podzolic soil in relation to the toxic effect of chlorine in potassium salt fertilizer or the application of potassium sulfate. The results showed that addition of potassium salt decreased the crop yield by 9.6 centners/ha, while application of potassium sulfate increased the harvest by 18.0 centners/ha. Increasing the application of the nitrogen fertilizer decreased the toxic effects of the chlorine present in the potassium salt fertilizer 2.5 fold, and nitrogen/phosphorus fertilizers were even more effective; in addition, the concentration of chlorine in the tubers decreased from 231 to 137 mg%. The decrease in the chlorine concentration was accompanied by elevation of the protein content of the tuber and an increase in the concentration of the essential amino acids. Figures 1; references 6 (Russian).

[323-12172]

# ANALYSIS OF AGRONOMIC EFFECTIVENESS OF MINERAL FERTILIZERS, PART 2: EVALUATION OF DIFFERENTIAL METHOD

Moscow AGROKHIMIYA in Russian No 6, Jun 82 (manuscript received 9 Jul 81)  
pp 107-111

KOROGODOV, N. S., Scientific Institute of Fertilizers, Insecticides, and Fungicides, Moscow

[Abstract] An analysis of the effectiveness of mineral fertilizers in increasing crop yields, showed that the resultant increment in the crop yield is not a product of simple arithmetic addition of the increases to be expected from the addition of individual fertilizers (N, K, or P). The factor that is generally neglected in such calculations is the soil concentration of N, K, or P which will contribute to the optimum levels of added mineral fertilizers for a given crop. Consequently, meaningful calculations have to take into account existing mineral conditions in the soil and the contribution they make to the effectiveness of fertilizers. Otherwise meaningless data are obtained which lead to absurd cost-effectiveness calculations for mineral fertilizers. References 5 (Russian).

[323-12172]

# EFFECT OF SOLUBLE PHOSPHATES ON ASSIMILATION OF ELEMENTARY RED PHOSPHORUS DURING YEAR OF APPLICATION OF PHOSPHATE MIXTURE TO SOIL

Moscow AGROKHIMIYA in Russian No 7, Jul 82 (manuscript received 28 Jul 81)  
pp 34-42

GLADKOVA, K. F. and BULAYEVA, V. G., Dolgoprudnyy Agrochemical Experimental Station imeni D. N. Pryanishnikov; Scientific Institute of Fertilizers, Insecticides, and Fungicides, imeni Ya. V. Samoylov, Moscow Oblast

[Abstract] Radioisotope studies were conducted to determine the effects of soluble phosphates on the assimilation of red phosphorus by Orel oats grown in vessels on dernovo-podzolic loam (Moscow Oblast) and high-quality chernozem soil (Khar'kov Oblast). The results of the experiments demonstrated that in application of red phosphorus and  $\text{KH}_2\text{PO}_4$  in a 2:1 ratio the assimilation of the former is 1.6-3.1-fold lower than of the soluble potassium phosphate, but that red phosphorus accounts for 19-32% of total phosphorus uptake. Application of red phosphorus in a ratio of 1:1 to  $\text{KH}_2\text{PO}_4$  showed that red phosphorus accounted for only 16-21% of the total phosphorus uptake. The uptake of red phosphorus was immediate and did not require preliminary transformation into a soluble form via oxidation. Figures 2; references 5: 1 Western, 4 Russian. [324-12172]

# POSSIBILITY OF PERIODIC APPLICATION OF AMMOPHOS, UREA PHOSPHATE, AND LIQUID AND SOLID FORMS OF AMMONIUM POLYPHOSPHATE ON DERNOVO-PODZOLIC SOIL, PART 2: LEVELS, REMOVAL, AND BALANCE OF NUTRIENTS

Moscow AGROKHIMIYA in Russian No 7, Jul 82 (manuscript received 7 Aug 80)  
pp 47-54

KUZ'MENKOV, A. V., FILATOVA, L. M. and YANISHEVSKIY, F. V., Scientific Institute of Fertilizers, Insecticides, and Fungicides, imeni Ya. V. Samoylov, Moscow

[Abstract] Studies were conducted on the effectiveness of periodic and annual application of water-soluble phosphates on the uptake of nitrogen, phosphorus, and potassium by winter wheat (Mironovskaya 808) and potatoes (Lorch) from dernovo-podzolic soil. The results showed that periodic and annual application of phosphorus to dernovo-podzolic soil may initially increase the levels of nutrients in the plants and soil on acidic soil with poor fertility, but that with continuous cultivation the manner of phosphorus application has no telling effect on the parameters in question. References 13: 1 Western, 12 Russian. [324-12172]



ACCUMULATION OF STRONTIUM-90 AND CESIUM-137 IN CROPS IN RELATION TO  
PHYSICOCHEMICAL CHARACTERISTICS OF SOIL

Moscow AGROKHIMIYA in Russian No 7, Jul 82 (manuscript received 14 Aug 81)  
pp 117-119

MALIKOV, V. G., PEREPELYATNIKOVA, L. V. and ZHUKOV, B. I., North Caucasian  
Scientific Research Institute of Phytopathology, Krasnodar

[Abstract] Studies were conducted on the effects of soil levels of calcium carbonate on crop (grains, vegetables, fodder) uptake of strontium-90 and cesium-137. The results showed that a soil content of 2.2-3.2% carbonate reduced strontium-90 accumulation in the plants 1.1-3-fold, and promoted cesium-137 uptake 1.3-4-fold. It appears that the calcium carbonate levels in the soil are responsible for the extent to which strontium-90 is firmly bound to soil particles and that elevated levels of carbonate favor the formation of soluble forms of cesium-137 which are more easily assimilated by plants. References 6 (Russian).  
[324-12172]



## FREE RADICALS

UDC 543.422.27:541.515:547.1'118

### NITROXYL PHOSPHORUS-CONTAINING RADICAL WITH TWO C-P BONDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 29 Jan 82) pp 1434-1435

KARDANOV, N. A., TRIFONOVA, S. A., ZHDANOV, R. I., GODOVIKOV, N. N. and KABACHNIK, M. I., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow; Scientific Research Institute for Biological Testing of Chemical Compounds, Kupavna

[Abstract] The authors synthesized a nitroxyl phosphonate (I) that is a paramagnetic model of esters of alpha-oxyphosphinic acids which have muscarinolytic activity. The synthesis was accomplished by oxidation (of the corresponding amine of I) using *m*-chloroperbenzoic acid or  $H_2O_2$  with sodium tungstate. The ESR spectrum of I in benzene was a triplet with  $a_N = 15.5$  gauss and  $5.5 \cdot 10^{23}$  spin/mole. Chemical procedures are summarized. References 4: 3 Russian, 1 English. [285-12131]

UDC 541(124.7+127)+547(223+258.11)

### FREE RADICAL REACTION MECHANISMS, PART 16: STEREOSELECTIVITY OF FREE RADICAL DEHALOGENATION OF EXO- AND ENDO-2-BROMONORBORNANES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 7, Jul 82 (manuscript received 7 Dec 81) pp 1482-1485

DNEPROVSKIY, A. S., PERTSIKOV, B. Z. and TEMNIKOVA, T. I., Leningrad State University imeni A. A. Zhdanov

[Abstract] The method of competitive reactions was employed in studies on free radical reduction of exo- and endo-2-bromonorbornanes, using the organic hydride radical  $R_3E\cdot$  ( $R = C_2H_5, C_4H_9, (CH_3)_3SiCH_2$ ;  $E = Si, Ge, Sn$ ). The preferential detachment of the exo-atom Br, as well as the changes in selectivity vis-a-vis the free radical employed, were ascribed to torsion

effects in the transitional phase of the Br atom transfer. Furthermore, the relative rate of Br detachment was virtually temperature-independent, which indicates entropic control of selectivity and the fact that reactivity was dependent on steric interactions. References 18: 3 Russian, 15 Western. [325-12172]

UDC 547.421+547.412.124+541.124

FREE RADICAL TRANSFORMATIONS OF 2-ALKOXY-1,3-DIOXOLANES IN  
POLYHALOGENALKANES

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 7, Jul 82  
(manuscript received 13 Apr 81) pp 1486-1489

ROL'NIK, L. Z., KALASHNIKOV, S. M., PASTUSHENKO, Ye. V., ZLOTSKIY, S. S.  
and RAKHMANKULOV, D. L.

[Abstract] Investigations on the free radical transformations of 2-alkoxy-1,3-dioxolanes showed that 2-ethoxy-1,3-dioxolane in bromoform is acted on by radicals formed from thermal decomposition of benzoyl peroxide to yield ethylenecarbonate, ethyl(2-bromoethyl)carbonate, acetaldehyde, 2-bromoethylformate, and bromoethane. The products initiated by tert-butyl peroxide from 2-hexoxy-1,3-dioxolane in chloroform are ethylenecarbonate, hexyl(2-chloroethyl)carbonate, ethylhexylcarbonate, caproaldehyde, 2-chloroethylformate, and hexane. A flow chart is included for the transformation of 2-alkoxy-1,3-dioxolanes. References 5 (Russian). [325-12172]

UDC 542.85:[547.569.3+547.413.4]

FREE RADICAL CHLOROVINYLLATION OF DIPHENYL SULFIDE WITH TRICHLOROETHYLENE

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 7, Jul 82  
(manuscript received 15 Dec 81) pp 1555-1556

MIRSKOVA, A. N., MARTYNOV, A. V. and VORONKOV, M. G., Institute of Organic Chemistry, Siberian Branch, USSR Academy of Sciences, Irkutsk

[Abstract] Reaction of trichloroethylene with diphenyl sulfide resulted in the production of phenyl-beta,beta-dichlorovinylsulfide, phenyltrichlorovinylsulfide, and small quantities of trans-phenyl-alpha,beta-dichlorovinylsulfide, as well as low boiling-point compounds apparently representing trichloroethylene oligomers. The least amount of conversion occurred when the reaction was initiated with benzoyl peroxide (10% in 30 h); with UV irradiation in pyrex tube, 90% conversion was obtained in 28 h, and in a quartz tube 80-85% conversion was seen in 18-20 h. References 4: 1 Russian, 3 Western. [325-12172]

## ION EXCHANGE PHENOMENA

UDC 546.841:66.08

### EFFECTIVENESS OF ION EXCHANGE SEPARATION OF THORIUM AND SCANDIUM

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 9 Oct 81) pp 390-393

KAZANTSEV, Ye. A., BEZVORITNIY, V. A. and Kholmogorov, S. N.

[Abstract] Current methods for ion exchange separation of thorium and scandium are based on selective elution from ionites by solutions of organic complex-forming substances after quantitative sorption; these methods consume expensive reagents, with little yield. The authors present results of separating the title elements directly at the stage of sorption by ionites from hydrochloride solutions, using various domestic resins containing sulfur, carboxyl or phosphorus as bases. Porous ionites were found to be more adsorbing for thorium than more similar gel types, and carboxyl-containing ionites at  $\text{pH} < 1$  were the least suitable. Thorium was found to adsorb more readily in most cases than scandium, thus guaranteeing the desired separation on all ionites except an aminocarboxyl ampholyte (ANKB-10). Desorption of partially adsorbed scandium from sulfo-resins was accomplished using neutral salt solutions, while thorium was effectively desorbed by sulfate- and carbonate-containing solutions. Figures 2; references 10: 8 Russian, 1 Polish, 1 English.  
[291-12131]

## NITROGEN COMPOUNDS

UDC 547.79.371:385.1

### ATTACHING DI(HYDROXYMETHYL)TRIAZOLS AND OXADIAZOL TO ACTIVATED SHORT BONDS

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 6, Jun 82  
(manuscript received 26 Oct 81) pp 1319-1324

KIRILLOVA, L. P., TIKHONOVA, L. G., GAREYEV, G. A. and VERESHCHAGIN, L. I.,  
Institute of Petroleum and Coal Chemical Synthesis of the Irkutsk State  
University imeni A. A. Zhdanov, Angarsk

[Abstract] Continuing earlier research, the authors studied attachment of 1-alkyl-4,5-di(hydroxymethyl)-1,2,3-triazols and 3,4-di(hydroxymethyl)-1,2,5-oxadiazol to double bonds of vinylbutyl ester and acrylonitrile, and to triple bonds of mono- and diacetylene ketones. Results showed that 1-butyl-4,5-di(hydroxymethyl)-1,2,3-triazol and 3,4-di(hydroxymethyl)1,2,5-oxadiazol very easily react to produce good yields of the corresponding acetals in the presence of catalytic quantities of hydrochloric acid; the first required heating to 30-50°C, but the second produced heat. Nucleophile attaching of diols to the double bond of acrylonitrile took place in the presence of a strong base (KOH), producing monocyanoethyl esters, alcohols and in the case of the cyanoethylation of glycol, a 10% yield of dicyanoethyl ester. While alcohols and phenols attach to alpha-acetylene ketones to form alkoxy(aroxy)vinylketones, secondary attaching of the nucleophile to the double bond of alkoxyvinylketones is hampered by competition from the carbonyl group and ether oxygen. The diacetylene ketone 1,5-diphenyl-1,4-pentadiene-3-one reacts with alcohols primarily at a single acetylene bond, with the electrophilicity of the second triple bond decreasing due to the electron donor action of the alkoxy residue, hampering attachment. All products were confirmed by infrared spectra. Chemical procedures are given in the experimental section. References 7 (Russian). [284-12131]

## REDUCING CYANIDE AND ACETONITRILE BY PROTON NITROGEN-FIXING SYSTEMS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 6, Jun 82 (manuscript received 29 Jul 81) pp 1258-1260

PERSHIKOVA, N. I., NIKONOVA, L. A. and KITAYGORODSKIY, A. N.,  
Institute of Chemical Physics, USSR Academy of Sciences, Chernogolovka

[Abstract] The physiological function of nitrogenase is to reduce  $N_2$  to  $NH_3$ , but several other reductive reactions have been noted in the enzyme system. The authors compared the enzyme's reactions to those of model proton nitrogen-fixing systems to study the reactions of  $CN^-$  and  $CH_3CN$  in model systems based on V(II), Cr(II) and Ti(III). In all the systems studied, and in contrast to the enzyme, the basic products of reduction by both substrates used were amines, with noticeable quantities of hydrocarbons forming only on Ti and Cr hydroxides. There was no correlation between the effectiveness of the model systems and ratios of four- and six-electron reduction of the two substrates. The tested systems in some cases modelled the enzyme action, as when the molybdenum-thiol system reduced cyanide and acetonitrile to hydrocarbons and ammonia. References 5: 1 Russian, 4 Western.  
[285-12131]

## INFRARED AND ULTRAVIOLET SPECTRA OF ALPHA- AND BETA-METHYLHYDRAZIDES OF AROMATIC ACIDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 6, Jun 82 (manuscript received 23 Sep 81) pp 1405-1408

SARAPULOVA, G. I., CHIPANINA, N. N., VOLKOVA, L. I., SULTANGAREYEV, R. G.,  
KHLOPENKO, N. A., LOPYREV, V. A. and FROLOV, Yu. L., Institute of Organic  
Chemistry, Siberian Branch, USSR Academy of Sciences, Irkutsk

[Abstract] While the structure, reactivity and pH properties of unsubstituted aromatic acid monohydrazides have received much attention, the effect of substitution on the molecular structure of alpha- and beta-methylsubstituted mono- and dihydrazides has received little study. The authors studied the infrared and ultraviolet spectra of such hydrazides. Absorption band data indicate that the C=O and NH groups are joined in an intermolecular hydrogen bond. The presence of substituents on the nitrogen atoms leads to changes in atomic configuration of the hydrazine fragment. The position of a biphenyl system suggests weaker intermolecular bonds in dihydrazides than in monohydrazides. Figure 1; references 9: 7 Russian, 2 English.  
[285-12131]

CONFORMATIONAL ISOMERISM OF 1,2-DIFORMYL-, DIACETYL-, AND DI(TRIFLUORACETYL)-  
HYDRAZINES AND THEIR METHYL ANALOGS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian N° 6,  
Jun 82 (manuscript received 22 Dec 81) pp 1428-1430

KALIKHMAN, I. D., BANNIKOVA, O. B., MEDVEDEVA, Ye. N., YUSHMANOVA, T. I.  
and LOPYREV, V. A., Institute of Organic Chemistry, Siberian Branch,  
USSR Academy of Sciences, Irkutsk

[Abstract] Delayed rotation around N-CO and N-N bonds of diacylhydrazines is a property of a large number of rotamers. NMR and PMR data indicate isomerism only for N,N'-dibenzylcarbalkoxy-, diacetyl- and tetraacetylhydrazines, while for 1,2-diacylhydrazines and their MeN analogs, and apparently for hydrazone derivatives, the rotation barrier for the N-N bond is 5-7 kilocalories/mol. The authors studied conformational features of 1,2-diacylhydrazines and analogous systems. The best spectral relationships were found for 1,2-dimethyl derivatives. The effect of structure and environment on conformer frequency is discussed. References 15: 4 Russian, 11 Western.  
[285-12131]



ORGANOMETALLIC COMPOUNDS

UDC 541.63:541.49:547.567:546.811'131

STEREOCHEMICAL FEATURES OF PARAMAGNETIC COMPLEX FORMED IN REACTION OF  
3,6-DI-TERT.BUTYLORTHO BENZOQUINONE WITH TETRACHLOROSTANNANE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 6, Jun 82 (manuscript received 8 Jul 81) pp 1275-1282

PROKOF'YEV, A. I., KASYMBEKOVA, Z. K., BUBNOV, N. N., SOLODOVNIKOV, S. P.  
and KABACHNIK, M. I., Institute of Heteroorganic Compounds  
imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] Orthoquinones react with halides of metals of the third and fourth groups to form chelate paramagnetic complexes; the latter have been studied by electron spin resonance, and found to form by ligand substitution (of a chlorine atom in the metal halide) by orthoquinone. The unpaired electron reacts with ring protons of the aromatic ligand and magnetic isotopes of the central atom. To further explain these processes, the authors studied the impact of temperature, solvent type and complexing additives with a 3,6-di-tert.butylpyrocatechin ligand. Temperature changes from 0 to 100°C had an inverse relationship to linking with chlorine atoms, with a transition from quadruplet to deciplet. The high rotation barrier of the  $\text{SnCl}_3$  group in the paramagnetic complex was attributed to the chelate structure in which the Sn atom was bonded to 2 oxygen atoms. Further discussion centers on the impact of complexing additives on electron spin resonance spectra. Toluene and ethanol are grouped with tetrahydrofuran as additives with little impact, while a group of acetone, acetonitrile and dimethylformamide caused more noticeable changes. The complex was found to have a five-membered structure which changed to an octahedron as electron donor molecules were coordinated to a tin atom. Figures 4; references 11: 6 Russian, 5 Western. [285-12131]

## NEW HYDROGENATION SYSTEMS IN ION HYDROGENATION REACTION

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 5 Aug 81) pp 1322-1326

BOLESTOVA, G. I., LATYPOVA, F. M., PARNES, Z. N. and KURSANOV, D. N., Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] The common ion hydrogenation (IR) reaction generally uses triethylsilane as a donor, but a search for new hydrogenation systems that would allow further application of IR has been in process. The authors discuss ethyldichlorosilane (EDCS) in this reaction. It requires the presence of Lewis's acid to promote Si-H breakdown and increase the concentration of carbocations. The authors found that with  $AlCl_3$  or  $AlBr_3$ , EDCS reacts with olefins, haloid alkyls, trifluoroacetates of alcohols and 2-alkylthiophenes. 1-methylcyclohexene reacted with EDCS and toluene-sulfonic acid in the presence of an equimolar quantity of  $AlHal_3$  to form methylcyclohexane, a product of hydration with 65-75% yield after 2 hours at 40°C. EDCS and  $AlHal_3$  brought hydrogenolysis of haloid alkyls leading to saturated hydrocarbons, with yields varying from 40-80%. Reactions with other C-H donors produced far lower yields. Results showed that aromatic hydrocarbons with a tertiary carbon atom in a side chain can be used in the presence of aluminum haloids to obtain saturated hydrocarbons from olefins, haloid alkyls and alcohol trifluoroacetates. Chemical procedures are given in the experimental section. References 7: 2 Russian, 5 Western. [285-12131]

UDC 542.91:547.1'119:547.235.4

## REACTION OF 2,5-DIPHENYLDIAZOARSOL WITH DIPHENYLDIAZOMETHANE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 18 Jan 82) pp 1432-1433

ARBUZOV, B. A., DIANOVA, E. N. and CHADAYEVA, N. A., Chemical Institute imeni A. M. Butlerov, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] Previously examples of diazoarsol and nitrons were used to show cycloattachment at the As=C bond of bicoordinated arsenic atoms. The authors show here that the title reaction at 80°C without a solvent leads to the attachment of diphenylcarbene at the As=C bond. The product is 2,4,6,6-tetraphenyl-1-arsa-2,3-diaza-bicyclo-[3,1,0]-hexene-3. Composition and structure were confirmed by infrared,  $^1H$  and  $^{31}P$  NMR, and mass spectra. References 2 (Russian). [285-12131]

## ORGANOPHOSPHORUS COMPOUNDS

UDC 541.127.4:547.1'118

### ALKALINITY OF PHOSPHONYLALKYLAMINES IN WATER AND ETHANOL

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 6, Jun 82 (manuscript received 11 Jun 81) pp 1265-1267

KURGUZOVA, A. M., KUDRYAVTSEVA, L. A., TEYTEL'BAUM, A. B., BEL'SKIY, V. Ye.  
and IVANOV, B. Ye., Institute of Organic and Physical Chemistry  
imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] In studying ionization of phosphonylcarboxylic acids, it was found that the phosphonyl group influenced the reaction center by an induction method. The authors compared the nature of a phosphonyl group effect on  $pK_a$  of amines and carboxylic acids. The magnitude of  $pK_a$  of phosphinylalkylamines measured in water and ethanol correlated with the sum of induction constants of substituents at the nitrogen atom; correlations improved markedly as amines with phosphonyl groups in the alpha-position were separated. When ethanol replaced water in the reactions, the  $pK_a$  of the amines changed in agreement with the Bronsted principle. The good correlations of substituted alkylmethylenamines point to the conclusion that their alkalinity is determined by the induction effect of substituted alkyls and is not sensitive to steric influence of substituents.

Figure 1; references 8: 5 Russian, 3 Western.  
[285-12131]

UDC 542.97:547.1'118

### ACID CATALYSIS IN REACTIONS OF TRITHIOPHOSPHITES WITH ACYLHALIDES

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6,  
Jun 82 (manuscript received 31 Jul 81) pp 1386-1388

AL'FONSOV, V. A., ZAMALETDINOVA, G. U., BATYYEVA, E. S. and PUDOVNIK, A. N.,  
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan'  
Branch, USSR Academy of Sciences

[Abstract] In contrast to oxygen-containing acid esters of P(III), thioesters react with acylhalides while maintaining the coordination number of phosphorus,

yielding products with thioalkyl groups substituted at the haloid. Previous studies showed that the great majority of substitutions and exchanges for P(III)-O as well as P(III)-N systems involve acid catalysts. To demonstrate the hypothesis that acid impurities in the initial reagents are responsible for the formation of final products in the title reaction, the authors studied reactions of triethyltrithiophosphite with acetyl bromide and trichloroacetyl chloride. The composition and structure of the compounds produced were verified by infrared and  $^{31}\text{P}$  NMR spectra. The effects of adding acetic acid, hydrogen chloride and water to the reacting mixture were also assessed, indicating that water or acid additives accelerated the process of attaching the thioalkyl group to the haloid. Apparently the acid catalyst contributed to the formation of an anhydride derivative of P(III) and a mercaptan. Chemical procedures are given in the experimental section. References 8: 6 Russian, 2 English.  
[285-12131]

UDC 542.91:547.1'118

#### NEW BICYCLIC PHOSPHORANES WITH P-H BONDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 27 Oct 81) pp 1408-1409

PUDOVIK, M. A., TERENT'YEVA, S. A. and PUDOVIK, A. N., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Properties of P-alkylated 4,5-benzo-1,3,2-oxazaphospholanes depend greatly on the nature of substitution at the endocyclic nitrogen atom. The authors studied these compounds with hydroxyalkyl groupings at the N atom and hypothesized that HO groups contributed to stabilization of such systems. Initial compounds used were diamides of alkyl(aryl)phosphonium acids and N-(beta-hydroxyethyl)-o-aminophenol. The expected oxazaphospholane derivatives did not form; rather, bicyclic phosphoranes with P-H bonds were produced by intramolecular attaching to P(III) in the beta-position of the HO group. Their structure was confirmed by  $^{31}\text{P}$  and  $^1\text{H}$  NMR, infrared spectroscopy and element analysis. Chemical procedures are given in the experimental section. References 4: 3 Russian, 1 English.  
[285-12131]

## REACTION OF PHOSPHINES WITH DIPHENYLCARBODIIMIDE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 24 Nov 81) pp 1416-1417

PUDOVIK, A. N., ROMANOV, G. V. and STEPANOVA, T. Ya., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] Little has been published on reactions of primary or secondary phosphines with carbodiimides. At about the same time results of the reaction of di-*p*-tolylcarbodiimide with diphenylphosphine were reported, the authors found in studying reactions of dibutyl-, diphenyl- and phenylphosphine with diphenylcarbodiimide that secondary and primary phosphines react readily with that compound, forming corresponding formamidinophosphines. The reaction capability of phosphine containing a trimethylsilyl group at the P atom increases sharply, so that the reaction with diphenylcarbodiimide is accompanied by a strong exothermal effect leading to formation of 1-trimethylsilyl-1,2,3-phosphaguanidine. When formamidinophosphines are treated with CH<sub>3</sub>I, the P-C bond in the P-C=N fragment breaks and corresponding methylphosphoniumiodides form. Chemical procedures are given in the experimental section. References 5: 3 Russian (1 translation from English?), 2 Western.  
[285-12131]

## PMR SPECTRA AND CONFORMATION OF CERTAIN SEVEN-MEMBER HALOIDANHYDRIDES AND ESTERS OF ARSENOUS ACID WITH PLANAR FRAGMENT

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 18 Jan 82) p 1432

ARBUZOV, B. A., AGANOV, A. V., KLOCHKOV, V. V., ANONIMOVA, I. V. and CHADAYEVA, N. A., Chemical Institute imeni A. M. Butlerov, Kazan' State University imeni V. I. Ul'yanov-Lenin

[Abstract] The authors made the first study of conformational properties of certain 2-substituted 5,6-benzo-1,3,2-dioxarsepine and 1,3,2-dioxarsepines. Comparison of chemical shifts of methylene protons of six- and seven-member heteroanalogs confirm a skewed balance in the firection of the  $\alpha$ -chair form. One product showed significantly broader lines in the PMR spectra, depending on the concentration and type of solvent. References 4: 3 Russian, 1 Western.  
[285-12131]



## SYNTHESIS OF 1,3,4-TRIPHENYL-1,3,4-AZADIPHOSPHACYCLOPENTANE

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian  
No 6, Jun 82 (manuscript received 15 Feb 82) pp 1436-1437

ARBUZOV, B. A., YERASTOV, O. A., NIKONOV, G. N. and YEFREMOV, Yu. Ya.,  
Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov,  
Kazan' Branch, USSR Academy of Sciences

[Abstract] When a mixture of phenylphosphine and bis(diethylaminomethyl)-phenyl phosphine is heated at 130-150°C (PhP)<sub>5</sub> and (PHP)<sub>4</sub>CH<sub>2</sub> are formed (Kaska, et al., 1974). The authors of the present article found that adding phenylazomethylene to that reaction led to formation of a new heterocycle with a P-P bond, the title system. The structure was confirmed by mass-spectrum. Reference 1 (Western).

[285-12131]

## DYNAMIC STEREOCHEMISTRY OF PHOSPHORYLATED N,S-DIMETHYL-N'-ALKYLISOTHIUREA: Z,E-ISOMERIZATION AND PHOSPHOROTROPY

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 265, No 1, Jul 82  
(manuscript received 20 Nov 81) pp 106-108

NEGREBETSKIY, V. V., GRAPOV, A. F., ZONTOVA, V. N., IVANCHENKO, V. I.  
and MEL'NIKOV, N. N., corresponding member, USSR Academy of Sciences,  
All-Union Scientific Research Institute for Chemical Means of Plant  
Protection, Moscow

[Abstract] Previously the authors studied Z,E-stereoisomerization of a number of N-phosphoryl(thiophosphoryl)-N',S-dialkylisothiureas. In the present work transformations are examined in a number of N-dialkoxyphosphoryl-N,S-dimethyl-N'-alkylisothiureas obtained by the Atherton-Todd reaction of N-alkyl-N,S-dimethylisothiureas with dialkylphosphites in the presence of triethylamine in a medium of carbon tetrachloride. Asymmetrical trisubstituted isothiureas were phosphorylated at both the methyl and ethyl group nitrogen atoms. At temperatures up to 100°C rapid Z,E-isomerization occurred while temperatures of 180-200°C were accompanied by phosphorotropic tautomerism. Rates of Z,E-isomerization were not related to the nature of the solvent, nor was the free energy of phosphorotropy dependent on the concentration. Thus phosphorotropic transformation occurred primarily by an intramolecular mechanism. Chemical details are given in an experimental section. References 6 (Russian).

[293-12131]



## REACTION OF TRIMETHYLSILYLPHENYLPHOSPHINE WITH CARBONYL COMPOUNDS

Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA KHIMICHESKAYA in Russian No 6, Jun 82 (manuscript received 24 Nov 81) pp 1417-1419

PUDOVIK, A. N., ROMANOV, G. V., and STEPANOVA, T. Ya., Institute of Organic and Physical Chemistry imeni A. Ye. Arbuzov, Kazan' Branch, USSR Academy of Sciences

[Abstract] While related reactions have received much attention, little has appeared on reactions of P(III) derivatives such as  $\text{RPH}(\text{SiMe}_3)$ . Continuing their earlier research, the authors studied the reaction of the title phosphine with benzaldehyde and a methyl ester of pyroracemic acid. Differential thermal analysis data of the first reaction show that it is accompanied by an exothermal effect beginning at  $60^\circ\text{C}$  and continuing to  $85^\circ\text{C}$ , yielding a mixture of isomers of  $\alpha$ -trimethylsiloxybenzylphenylphosphine. Reaction with the methyl ester of pyroracemic acid takes place in an exothermal manner and leads to a mixture of diastereomers of ( $\alpha$ -trimethyl-siloxy)- $\alpha$ -carbomethoxyethylphenylphosphine. Chemical procedures are given in the experimental section. References 6 (Russian). [285-12131]

## PESTICIDES

### INTRODUCTION TO PLANT GROWTH REGULATORS

Moscow REGULATORY ROSTA RASTENIY (NOVOYE V ZHIZNI, NAUKE, TEKHNIKE: SERIYA 'KHIMIYA') in Russian No 6, Jun 82 (signed to press 9 Jun 82) pp 2-7, 56-62, 64

[Annotation, table of contents, biographical sketches of authors, foreword and chapter titled "Use of Plant Growth Regulators in Practical Plant Growing" from book "Plant Growth Regulators" by Yuriy Aleksandrovich Baskakov and Aleksandr Alekseyevich Shapovalov, published in "Advances in Life, Science, Technology: Chemistry Series", Izdatel'stvo "Znaniye", 28,680 copies, 64 pages]

[Text] Harmonic development of plants occurs owing to certain substances called biological phytohormones. The following question was posed to chemists: Can synthetic analogues of these natural substances be found, and can they be used to raise the productivity of agricultural crops? This book describes how this truly miraculous chemistry developed. It will be useful to lecturers, propagandists and students of people's universities.

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#### Biographical Sketches of Authors

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#### Foreword

Creation of an effective system of controlling the growth and development of plants has been and continues to be one of the important tasks facing mankind. The reason for this lies in the important role played by plants in the life of man and in all of the earth's biosphere. A significant proportion of the energy and labor invested into agricultural production and its complex agro-technical procedures is aimed precisely at achieving a controlling influence by which to force plants to function in the way we need them to, though unfortunately we are not always successful in this effort.

Each successive stride on this road is more and more difficult. In the meantime a significant share of mankind has suffered and continues to suffer from a chronic food shortage throughout all of its history. This is why attempts are being made to utilize practically all achievements of science and technology to raise the productivity of plant growing. Today for example, in the beginning of the era of laser technology, attempts are being made to illuminate plants with laser beams, while at the beginning of this century, when enormous successes were achieved in chemistry, it seemed a natural idea to create substances which could cause plants to assume gigantic proportions.

In the organism, we distinguish between regulation at the intracellular and the extracellular (intercellular) levels. Growth and development are regulated, in the final analysis, at the cellular level on the basis of interaction between cells. Growth of an organ or an organism is the accumulation of the growth of its cells, while formation of specific organs or certain separate parts making up an organ is the result of the paths of development taken by cells.

Every living organism is subjected to continual quantitative and qualitative changes which may be interrupted by periods of rest. There exist the following definitions of the concepts "growth" and "development." Growth is irreversible neoformation of the structure of a living body or the substance of its parts. Development is qualitative change of the components of an organism, in which existing forms or functions are transformed into others. An example of growth is extension of a branch owing to multiplication and enlargement of the cells making it up, while an example of development is formation of sprouts out of seeds upon germination. Growth and development cannot be delineated sharply from one another.

Research started by Charles Darwin on the nature of signals governing intercellular interaction in plants became one of the main directions in the science of plant physiology. Even today, however, these questions are far from completely answered. Let us examine some examples illustrating the nature of intercellular communication in plants.

Movement is one of the most readily observable manifestations of life even in plants, though it generally proceeds much more slowly in them than in animals. It is no accident that precisely this class of physiological phenomena served as the basis for the first hypotheses concerning the existence of growth substances. Movements are closely associated with the processes of growth and development; in contrast to these processes, however, movements may be governed by external (stimulatory) factors, light and gravity for example. They may also be reversible.

A typical example of movements occurring at a rate typical of plants would be growth movements elicited by nonuniform growth of the opposite sides of some organ in response to the action of a stimulus. This class of movements includes phototropic bending, which is distinctly observed, as an example, in oat coleoptyles. The tip of an oat sprout bends in the direction of a light source when it emerges above the surface of the ground, thus bringing the photosynthesizing organs closer to the light. The time from the beginning of the action of the stimulus to the beginning of the visible reaction is 25-60 minutes in this case. It has been found that such bending is the product of a difference in the rate of cell growth, primarily in length. Growth is inhibited on the illuminated side, and it is stimulated on the dark side. By shading different portions of the coleoptyle we can reveal that only its uppermost part (about 250  $\mu$ ) is sensitive to the direction of illumination. By covering this portion with a foil hood we can prevent bending. The area of bending itself, in which nonuniform cell growth is observed, is located below the sensitive tip; moreover the nonuniformity in growth, which arises near the supersensitive area, gradually spreads downward toward the base at a rate equivalent to the rate of movement of nutrients along the coleoptyle. This pattern is also observed at the apex of the sunflower plant as well as in geotropic bending that occurs when plants orient themselves in a gravitational field.

Another typical example of the mutual influence exerted by parts of a plant on the growth process is the effect of apical dominance. It can be observed, for example, in a young spruce. Each year active vertical growth occurs only in the top shoot, while nearby lateral shoots grow much more slowly (almost in a horizontal direction). Were we to remove the apical shoot, one or several lateral shoots would begin to straighten out after a certain time, and one of the straightened shoots would assume the function of an apical shoot. From this moment on we observe the initial growth pattern once again. The effect of apical dominance can be easily explained if we assume that a certain inhibitory signal that blocks vertical growth of lateral shoots moves downward from the apical shoot (at the rate of flow of metabolites). This leads to formation of the typical crown of a young spruce promoting optimum development of the plant. The phenomenon of apical dominance is distinctly observed among a large number of plant species.

Investigation of flowering processes provides an even more interesting and visual idea of how chemical substances regulate plant growth and development by transmitting information necessary for regulation (this is the hormonal type of regulation). There are a number of events in growth and development which are regulated by the duration of daytime illumination--by day length. Formation

of the flower bud is one such event. Depending on sprouting conditions, a number of species flower only when day length rises above a certain critical value (long-day plants); when this critical day length is not reached, most such plants assume a rosette form or grow a short stem. Short-day plants flower when day length is below a certain critical value. The stem of such plants forms independently of day length, but in long-day conditions they exhibit only swift vegetative growth. Concurrently there are a number of species in which the length of the photoperiod does not influence flowering. Examples of long-day plants are spring cereal grains in the moderate zone; spinach and beets; short-day plants include rice, millet, flax and soy.

It has been established that the leaf is the organ which registers day length and produces the controlling signal. This signal travels from the leaf to the point at which the flower forms. A number of original grafting experiments have demonstrated the existence and the chemical nature of the signal. If we graft one leaf of a short-day plant to a long-day plant, the latter would flower in a short day, one in which the flowering hormone could be formed only in the grafted leaf. The opposite experiment can also be performed--grafting the leaf of a long-day plant. We can cause both long-day and short-day plants to flower in the presence of unfavorable day length if we graft them to flowering plants that are neutral in relation to photoperiod. If we place an opaque hood over just one leaf of two short-day plants joined together by grafting and grown in long-day conditions, thus creating a short day for that leaf, both plants would flower. Thus the flowering stimulus (hormone) is the same for long- and short-day plants and for plants neutral to day length. Having a chemical nature, it is transported from the leaf, where it is formed, to the growth zone, in which the flower develops.

Extensive research on the ways plant cells, tissues and organs interact led to the notion that signals responsible for such a relationship are predominantly chemical in nature. Phytohormones are the principal endogenous (natural) plant growth hormones. Phytohormones are formed in the plant itself, and they participate in growth, in formation of new organs, in transition to flowering, in sexual differentiation of flowers, in aging of leaves, in transition to a dormant state and in emergence from it--in other words, in all phases of the vital activities of plants.

Formed in certain plant organs or tissues, phytohormones travel to other tissues or organs, determining and directing the nature of processes occurring within them. These substances ensure the functional integrity of the plant organism and the coordinated activity of all of its parts. As a rule the regulatory action of phytohormones is highly specific, and other factors influencing the plant cannot substitute for them.

Scientists now divide the known phytohormones into five groups: auxins, gibberellins, cytokinins, ethylene and abscisic acid. Establishment of the chemical structure of phytohormones led to attempts at finding substances exhibiting similar action among their structural analogues. A significant number of synthetic plant growth regulators and herbicides, which have enjoyed extensive application in practical plant growing, were discovered as a result. Most of them are either analogues of phytohormones in relation to their nature of action upon the plant, or they influence the hormone balance of plants.



We will attempt to briefly review the history of the discovery, study and application of the basic groups of phytohormones and synthetic plant growth regulators below.

#### Use of Plant Growth Regulators in Practical Plant Growing

Use of plant growth regulators in practical plant growing began a little more than 30 years ago. This direction was found to be highly promising in the very first stages of its development; however, it was only in the last few years that the sphere and volume of the application of plant growth regulators began to expand rapidly. Use of growth regulators (in addition to using chemical plant protection resources and fertilizers) is one of the most promising ways of raising agricultural productivity. As was indicated earlier, this method of regulating plant growth and development in the direction we require does of course have its limitations, which must not be forgotten. These limitations are primarily the product of the potentials of the plants themselves. For example an attempt to hasten growth of valuable woody species by using gibberellins was unsuccessful because such acceleration of growth was accompanied by deterioration of the quality of the wood. This is why one of the factors of successfully using plant growth regulators is thoughtful formulation of the purposes for which they are to be used, and significant progress has recently been observed in this area.

Propagation of plants by cuttings is a widespread technique, but in addition to plants which root readily, the cuttings of some plants root poorly or not at all. Such plants include the apple, pear, plum, cherry, peach, conifers, nut trees, many ornamental woody species and pink.

The rooting of the cuttings of such plants, when obtained from sufficiently young shoots, is significantly facilitated by first processing them in auxin solutions or dusts. Indolylbutyric and  $\alpha$ -naphthylacetic acids are the most effective in this regard. Root formation stimulators are also used in the transplanting of seedlings, saplings and mature trees and shrubs. For this purpose their roots are submerged for 18-24 hours in an aqueous solution of indolylbutyric acid or  $\alpha$ -naphthylacetic acid (5-10 mg/liter) prior to planting, and then the root zone is irrigated two or three times in the course of the entire period of growth.

Growth in the number of nitrogen fertilizers introduced into the soil, especially in zones characterized by abundant precipitation, is causing swift growth and lodging of cereal grains, which is reducing the yields and sharply increasing the losses of grain during harvesting. This problem is being solved by two methods--creation of highly productive short-stemmed varieties of cereal crops, and use of effective retardants. The most broadly employed retardant is chlorocholine chloride (CCC). Just in the USSR alone, millions of hectares of wheat and rye have been processed with this compound. Winter wheat displays the greatest sensitivity to the retardant, and spring wheat and winter rye exhibit somewhat lesser sensitivities; barley and oats are not very sensitive to CCC. Spraying plants with the preparation at the beginning of the most active stem growth at a consumption rate of 4 kg/ha produces the greatest impact. A preparation based on 2-chloroethylphosphonic acid--kampoza--was



recently proposed for rye and oats. It is used at a dose of 1-4 kg/ha. The search for effective retardants for barley, rice and sunflower is continuing. Chlorocholine chloride was also found to be extremely effective in improving the planting quality of vegetables, which spread out owing to insufficient illumination when grown in a hothouse. Processing tomato plantations with 0.3-0.5 percent CCC solution makes the plants much more compact.

Alar was found to be a highly effective retardant in fruit growing. The spraying of young apple trees and other stone fruit crops with 0.2-0.5 percent Alar in June, 2 weeks after the end of flowering, inhibits shoot growth and stimulates flower budding. This effect persists for several years. Alar processing hastens the start of fruit bearing in young orchards, and it promotes formation of a compact tree crown making it possible to plant trees closer together. (Lakuill), an English horticulturalist, proposed an intensive orchard farming procedure using Alar, which came to be called the "meadow orchard" method. Apples are planted at a rate of 30,000-100,000 per hectare, and in the first year they are processed with Alar. In the second year the compact plants begin to bear fruit. After the harvest the plants are cut down to stumps, and aftergrowing shoots provide for the next 2-year cycle. Maleic hydrazide is used in ornamental horticulture to inhibit growth of lawns and living fences. It is introduced as a spray in spring and in the beginning of summer.

A broad spectrum of plant growth regulators has been proposed and is now being used to control flowering and fruiting. Substances produced from ethylene hold a dominant position among them--primarily 2-chloroethylphosphonic acid. Its main use is to promote early synchronous maturation of fruits and establishment of their abscission layer. This permits organization of mechanical harvesting of early fruits on a compressed schedule. An example would be tomatoes, the fruits of which mature nonuniformly when etrel is not used: The plants must be picked by hand three to five times with an interval of several days, and the fruits often fail to mature at all in certain strips. Etrel reduces outlays of manual labor and losses of the product. A similar pattern is observed in the harvesting of berries and fruit trees. Plants are treated with solutions of etrel (250-750 mg/liter) 5-14 days prior to the intended harvest day. Ethylene and etrel are also used to hasten maturation of harvested fruit. One practically valuable property of etrel is its ability to stimulate synchronous flowering in pineapple and change of the sex ratio of monoecious plants--cucumbers for example. In addition to ethylene derivatives, auxins are used to regulate fruiting. Tomatoes lose their ovaries and form small fruits (especially when the weather is poor during flowering), which is connected with a shortage of endogenous auxins. Spraying of plants with auxin solutions promotes better fruiting and production of partially or completely seedless fruits. These results are achieved with 4-chlorophenoxyacetic acid (parafen) in hothouse conditions and  $\beta$ -naphthoxyacetic acid in the field at a concentration of 40-50 mg/liter. Year-round citrus production is achieved in California by preharvest processing of lemons and oranges with a 0.0008 percent solution of 2,4-dichlorophenoxyacetic acid, as a result of which they remain green or greenish on the trees for a long period of time.

Processing seedless grape varieties with gibberellin is highly effective. A shortage of endogenous gibberellins causes poor fruit development in these varieties. Spraying of flowering plants with gibberellin solution (at a rate of 30 gm/ha) causes loosening of the bunches, enlargement of the fruits and, consequently, a 50-100 percent increase in yield.

One of the promising areas for use of growth regulators is control of dormancy in plants. Thus potato yields can be obtained twice a year in the country's southern regions. But it is practically impossible to preserve tubers from last year's harvest until the moment of replanting, while freshly harvested tubers of the first harvest assume a dormant state. By immersing them for 30 minutes in a solution containing 1 mg/liter gibberellin and 20 gm/liter thiourea we can interrupt dormancy and cause the tubers to begin sprouting in 4 or 5 days. Dormancy of the seeds of some plants may be interrupted with etrel. Growth regulators are effective against weeds that produce seeds which survive in soil for long periods of time without germinating, thus remaining insensitive to herbicides. For example introduction of etrel into soil at doses of 0.01-1.00 kg/ha stimulates synchronous germination of the seeds of *Striga*, a pest weed with seeds that remain dormant for the most part. Germinated seeds are easily killed with herbicides. Unfortunately, the known growth regulators cannot interrupt dormancy of all weed seeds.

Lengthening dormancy in vegetables and fruit is a more important problem connected with postharvest storage of agricultural products. Stored potato tubers begin sprouting as early as in March and April, and eyes can be removed only by hand. In 1939 the American scientist (Getri) established that the methyl ether of  $\alpha$ -naphthylacetic acid prevents sprouting of potatoes. This preparation was studied in the USSR, and a dust containing 3.5 percent methyl ether of  $\alpha$ -naphthylacetic acid was placed into production for the processing of potato tubers. A preparation which has come to be called M-1 is applied to tubers as a dust just prior to storage (at a rate of 3 kg per ton). Tekhnatsen (1,2,4,5-tetrachloro-3-nitrobenzene) and chlorpropham (isopropyl-3-chlorophenylcarbamate) are used extensively for these purposes abroad. The effectiveness of using maleic hydrazide to prevent sprouting of potatoes has been studied. Potato tops are sprayed with this regulator at a dose of 2.5 kg/ha 12-15 days prior to harvesting. Maleic hydrazide penetrates and accumulates in the tubers, where it subsequently inhibits sprouting.

An even more important problem is that of reducing losses of sugar during storage of sugar beet roots after harvesting. They are normally stored for several months in the open in piles (clamps) until processing. In 1 day, a ton of sugar beet roots lose about 200 gm of their sucrose due to respiration. These losses can be reduced by about half by spraying the plants with maleic hydrazide 12-15 days before harvesting at a dose of 2.5 kg/ha.

The active search for new synthetic growth regulators that can solve this problem is continuing today.

It should be considered that losses caused by development of fungal diseases--rots and molds--are also extremely great in stored tubers and roots. This predetermines the need for integrated use of growth regulators and preparations

suppressing development of fungi (fungicides) or creation of active substances exhibiting multiple action.

There is significant practical interest in finding and using substances that intensify and control transport of plant metabolites. It is believed that at the moment of harvesting, a significant quantity of carbohydrates remain in the leaves of sugar cane and sugar beets, and that the sugar yield could be increased by 5-10 percent by intensifying drainage of these carbohydrates from the leaves. This result can in fact be achieved by processing sugar cane with glyphosine at a dose of 2.0-6.4 kg/ha prior to harvesting. The possibility of treating sugar cane with the preparation, referred to here as "dizugran," is now being studied.

Research on the problem of obtaining latex from natural rubber--hevea--led to establishment of an important fact. Ethylene prevents fast coagulation of latex in air, owing to which cuts in tree bark function longer, and the total yield increases significantly. An attempt to replace ethylene by etrel produced a remarkable result. Latex production increases by several orders of magnitude in just 10 days after processing, and then it remains 1.5-2 times higher than in unprocessed trees for 10 months. Today this procedure is broadly employed in plantations, producing a significant economic impact.

Closely related to the problem of redistributing plant metabolites is the as yet unsolved problem of using growth regulators to alter the ratio of plant parts that are and are not used by man.

Despite discovery of such an effective preparation as DROPP, the problem of supplying defoliants to agriculture and especially to cotton growing has not been conclusively solved. It has been found that considering its high price, DROPP is insufficiently effective in the more-northerly cotton growing zone; for example in the USSR. This is why researchers are continuing their hunt for new defoliants.

Among the most important problems of plant growing, solution of which requires a search for new plant growth and development regulators, we should first of all point out the need for raising the resistance of highly productive varieties to unfavorable germination conditions such as low and high temperature, inadequate moisture and soil salinity. As a rule when plants are selected for higher productivity, their resistance to unfavorable conditions decreases. This problem is especially acute in our country, where the larger part of the cultivated land is within the "risky farming" zone, and fluctuations in the gross grain harvest attain 40 percent of the average harvest owing to unfavorable weather conditions. Researchers have noted many times that various growth regulators raise the resistance of plants to some extent. This question was studied especially extensively in connection with the use of the retardant chlorocholine chloride. In response to this preparation the structure of the plant acquires a number of unique features that raise its resistance to drought and low temperatures. They include more vigorous development of the root system, short stature and, in the case of seeds, deepening of the tillering node in cereal grasses (by 0.5-2 cm). However, this technique cannot solve the problem of raising the drought resistance of cereal grasses.

Closely related to the problem of protecting plants from unfavorable germination conditions is the task of raising the resistance of plants to infection by pathogenic microorganisms. It has been noted that many synthetic growth regulators, chlorocholine chloride in particular, make plants more resistant to diseases by reducing the permeability of cell walls and stimulating the work of the plant's defense systems. Also of interest are compounds exhibiting concurrent growth-regulating and fungicidal activity. For example a preparation named "tachigeren" (3-oxy-5-methylisoxazole), developed in Japan, forms two conjugates with glucosides in plants, one of which has growth-regulating and the other of which has fungicidal activity.

Great hopes are being laid upon plant growth and development regulators in relation to raising the effectiveness of photosynthesis. Less than 1 percent of the solar energy reaching the leaves is transformed photosynthetically into chemical energy. The effectiveness of this process is limited in the field by the plant's capability for fixing carbon dioxide. As an example 1 hectare of corn must assimilate 32,000 kg of CO<sub>2</sub> during the period of growth, which means it must process more than 100,000 tons of air. The productivity of this process may be increased by altering the form of the above-ground part of the plant in such a way as to improve air circulation in the field, and by changing the degree of dilation of the stomates, through which CO<sub>2</sub> enters the leaves.

It should be noted in the conclusion of this chapter that most substances used as plant growth regulators have extremely low toxicity in relation to man and animals. As a rule their toxicity in relation to insects, fish and plants themselves is low as well. Despite the fact that the cost of their production is rather high, the economic impact enjoyed from using growth regulators in plant growing is greater than that of using pesticides and fertilizers. The profit from using just etrel to raise latex yield more than compensates for the outlays on the research on growth regulators being conducted in the whole world.

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CSO: 1841/300



UDC 628.162

#### CHLORINATING HERBICIDES OF SYM-TRIAZINE GROUP IN AQUEOUS SOLUTIONS

Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 4, No 3, May-Jun 82  
(manuscript received 26 May 81) pp 252-254

TARAN, P. N. and KAS'YANCHUK, R. S., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dyman'skiy, UkSSR Academy of Sciences, Kiev

[Abstract] For their selective action and safety for cultivated plants, the title herbicides are widely used, but as algicides they pose a threat due to their stability. The authors sought ways to render them harmless, after such use, with active chlorine as the basis of a technical process for both natural and artificial sewage reservoirs. Experimental data for various models showed that treating symazine for 60 minutes at pH ranging from 2.5-10 and molar ratios of symazine and chlorine of 1:1 to 1:20 had no effect on symazine levels. The addition of chlorine water to a symazine solution did cause a medicinal odor suggesting the formation of N-chlorine derivatives. Further tests showed that this reaction occurred only in an acid medium. When a 20-molar excess of chlorine is used, at 19°C, organoleptically active N-chlorine derivatives formed at a rate depending on pH and the concentrations of the reactive agents. Since the derivative was stable even in the presence of large amounts of chlorine, the conclusion was that chlorination could not be recommended for removing sym-triazine from water. Figure 1; references 6 (Russian).  
[287-12131]

UDC 632.95

#### MORE EFFECTIVE USE OF PESTICIDES

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 4-6

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[Abstract] Among pesticides used in the Kazakh SSR, 50% of the 200,000 ton total are herbicides, 30% are insectoacaricides, 9% disinfectants, more than

7% fungicides and 3% defoliants and desiccants. The most common are organic chlorine and phosphorus compounds, derivatives of carbamic and chlorophenoxy-acetic acids and sym-triazines. Preparations containing mercury have been cut back, and among fungicides a significant place has gone to derivatives of dithiocarbamic acid and inorganic copper and sulfur compounds. Pesticide use has allowed Kazakhstan to produce from 9 to 33% of total Soviet production of particular crops, and to affect economies in labor and crop losses. Chemical means of plant protection are to be used even more broadly in the 11th Five-Year Plan. For more effective use, better mapping of pest distribution and integration of control systems must be achieved. Comprehensive field research is under way. Industrial technology must be brought to the production of sugar beets, cotton, soy beans, sunflowers, potatoes and other crops.

[297-12131]

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# FUNGICIDE ACTION OF PESTICIDES AND PLANT GROWTH REGULATORS (ANALYTICAL REVIEW)

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 29-31

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[Abstract] Recent research has shown that application of chemical means of plant protection has side effects, such as the effects of fungicides on soil microflora, those of growth regulators and herbicides on pathogens and soil microflora, and the influence of insecticides on pathogens. For example, 2,4-D herbicides have been observed to increase *Sitobium avenae* on oats, *Phopalosiphum padi* and *Ph. maydis* on corn, and *Acyrtosiphon Pisum* on legumes. 2,4-D also suppresses soil bacteria and actinomyces. Triazine herbicides reduced weed infestation in corn by 5-35%, but at the same time the incidence of low smut rose. Some herbicides had the opposite effect from expectations, as the increase of *Ihielaviopsis basicela*, after chlorambene application, showed. Use of symazine and igranso on spring and winter wheat at first suppressed, but later apparently stimulated, the infestation of powdery mildew. Bazagran and avadex were found to depress *Fusarium* fungi on cultures when the dose was 1000 mg/l. Among other side effects, fungicides were found to destroy beneficial microorganisms, while insecticides inhibited pathogen development and, in the case of organic phosphorus compounds, had some effect on verticillium wilt. References 40: 1 Russian, 1 Polish, 38 Western.

[297-12131]



## USING ERADICANE AND GLYPHOSATE IN COTTON CROP ROTATION

Moscow KHIMIYA V SEL'SKOM KHOZYAYSTVE in Russian No 6, Jun 82 pp 36-38

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[Abstract] Dalapon is commonly used to combat perennial grass weeds in cotton plantings, but its effectiveness on wire grass and beardgrass is of insufficient duration. In 1977-1979 the authors studied the effect of eradican and glyphosate on these weeds, as well as their aftereffects on cotton production. Respective applications as recommended for the Soviet Union, of 3.2-6.4 kg/ha of eradican and 2-4 kg/ha of glyphosate, were applied before corn in the crop rotation since they are toxic for cotton in these dosages. Cotton was planted the following year. The herbicides contributed to suppressing the target weeds and brought significantly higher corn yields. Both herbicides were found to remain in the soil and not leach out. Results indicated that eradican should be applied prior to corn in the crop rotation, while glyphosate should be applied on the growing target weeds after cotton picking in the rotation corn-hemp-melons-clover of the last growing year.

[297-12131]

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## HERBICIDAL EFFECTIVENESS OF PYCLORAM AS FUNCTION OF ITS SOIL ADSORPTION AND DETOXICATION UNDER VARIOUS HYDROTHERMAL CONDITIONS

Moscow AGROKHIMIYA in Russian No 6, Jun 82  
(manuscript received 15 Jul 81) pp 101-106

SPIRIDONOV, Yu. Ya., SHESTAKOV, V. G., BONDAREV, V. S., MATVEYEV, Yu. M., SPIRIDONOVA, G. S. and CHICHERINA, L. A., All-Union Scientific Research Institute of Phytopathology, Moscow Oblast

[Abstract] Studies were conducted on the effects of adsorption of pycloam to soil particles on its detoxication and herbicidal effects at 25 and 35°C and relative humidities of 60 and 90%. The results showed that the herbicidal activity against cocklebur was essentially determined by the degree of adsorption to soil particle, which was largely predicated on the hydrothermal conditions of the dernovo-podzolic soil. The actual herbicidal activity was less affected by the hydrothermal conditions than is usually the case with more stable herbicides. The actual duration of the biological activity did not exceed 14 days, although pycloam persisted in the soil for a prolonged period of time as indicated by half-life figures of 134-239 days. Figures 2; references 15: 5 Russian, 10 Western.

[323-12172]

EFFECTS OF ARYLAMIDE HERBICIDES ON SOIL ENZYMATIC ACTIVITY

Moscow AGROKHIMIYA in Russian No 6, Jun 82 pp 125-133

GALIULIN, R. V.

[Abstract] The enzymatic activity found in soil can be used to monitor the level of soil contamination with xenobiotics, including the arylamide herbicides. A review is presented on effects of various herbicides on such activity and on the need for proper standardization which would take into consideration the type of enzymatic activity measured, soil type, and the chemical nature of the herbicide employed. References 55: 3 Czech, 13 Western, 39 Russian.  
[323-12172]

UDC 66.094.37-911.4:661.715.25/.26

LIQUID PHASE OXIDATION OF COMPONENTS OF CASING-HEAD GASOLINE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 326-328

DAYAN, V. M., ASTVATSATRYAN, S. A., KUSHINA, I. D., PYZH, M. I.,  
PAZDERSKIY, Yu. A., BRYUKHOVETSKIY, V. A. and LEVUSH, S. S.

[Abstract] Oxidation of casing-head gasoline is the only industrial method for obtaining propionic acid and the basic method for obtaining formic acid used in the USSR. Seeking higher yields of the low carboxylic acids, the authors studied oxidation of various classes of hydrocarbons in the petroleum fraction under conditions analogous to those at the Yerevan production association involved in producing carboxylic acids. Various C<sub>5</sub>-C<sub>8</sub> hydrocarbons were studied at 155-195°C in 5 MPa of pressure. Isopentane, isooctane and cyclohexane were also studied. Waste gases were analyzed by chromatography for CO, CO<sub>2</sub> and hydrocarbons, while the oxidate was tested for acid content chemically and by chromatography for formic, acetic, propionic and butyric acids, acetone and water. Data indicate that yields of acetic acid from oxidation of n-hexane are significantly greater than production of formic and propionic acids, and they increase with deeper conversion of n-hexane. Increased temperature speeds conversion while also increasing the amount of pitch produced. The chief intermediate product is acetone, accounting for as much as 60% of the light by-products of oxidation. Oxidation of isopentane reduced production of propionic acid and increased acetone yield; acetic and formic acid quantities also fell. Cyclohexane oxidation produced various dicarboxylic acids. Figures 2; references 9: 7 Russian, 2 Western.  
[288-12131]

## PROTECTIVE ADDITIVES BASED ON MICROBIAL FATS FOR LUBRICANTS

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 7, Jul 82 pp 19-20

SALENKO, V. I., KAZANTSEV, Yu. Ye. and FEDOROV, V. V., All-Union Scientific Research Institute for Protein Synthesis

[Abstract] Current multi-functional protective additives for lubricants should contain phosphorus, amines, sulfur, and also carboxyl, hydroxyl and complex ester groups. Preparation of such additives involves multi-stage production and mixing. The authors' studies indicate that microbial fats contain essentially all the attributes desired. Lipid extracts from yeasts are recommended as additives on the basis of their results. The lipid extract of *Candida guilliermondii*, used as an example, contains non-saponified substances, free aliphatic acids, glycerides and phospholipids, each of which is discussed. The corrosion resistance of the phospholipids surpassed currently-used conserving additives in many parameters, and had no negative impact on physicochemical properties. Thus neutralized microbe fats are recommended to replace expensive additives that must be produced by complicated organic synthesis. References 10: 9 Russian, 1 English. [298-12131]

UDC 665.637.6:665.663.4

## OBTAINING LOW-CONGEALING OILS AND PARAFFINS BY CARBAMIDE DEPARAFFINIZATION METHOD

Moscow KHIMIYA I TEKHOLOGIYA TOPLIV I MASEL in Russian No 7, Jul 82 pp 8-9

KALAMBET, I. A. and DORODNOVA, V. S., Grozno Scientific Research Institute

[Abstract] Ethane cooling is required to obtain oils with congealing points lower than 15-20°C. Thus a process of carbamide deparaffinization that would be relatively simple and would not require special cooling equipment was deemed desirable. The authors selected filtrates from an oil separating device after basic solid paraffins had been removed. They were subjected to hydropurification with an aluminum-cobalt-molybdenum catalyst at 4 MPa pressure, 320°C, feed of 1.5 c<sup>-1</sup> and hydrogen-containing gas compressed to 500 m<sup>3</sup>/m<sup>3</sup>. Results showed that the initial mixed hydrocarbon filtrate was deparaffinized under these conditions to produce an oil that congealed on the average at temperatures 2-3° lower than controls. A benzene fraction at 80-120°C was used as the solvent and methanol served as the activator. Using distillates from Stavropol crude oil, it was possible to obtain oils that congealed at -30°C. References 4 (Russian). [298-12131]

## POLYMERS AND POLYMERIZATION

UDC 678.742.2.033:66.095.262

### ELECTRICALLY CONDUCTIVE POLYETHYLENE COMPOSITIONS PRODUCED BY POLYMERIZATIONAL FILLING

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 82 pp 6-7

BAULIN, A. A., KRASNOSHCHIEKOV, A. I., DEYANOVA, A. S. and VASILENOK, Yu. I.

[Abstract] Production of containers for inflammable and explosive substances usually involves electrically conductive polymers in which metal powders and carbon fillers are dispersed. Many mineral fillers cannot be used to produce conductive polyolefin compositions by polymerizational filling. The authors attempted to perform the title production with furnace black and fibrous technical carbon. The fillers were subjected to vacuum to about 10 Pa residual pressure, then heated at 200°C for 4 hours. Next they were processed with titanium tetrachloride in n-heptane at 70-80°C for 2 hours with constant mixing. After completion of polymerization, the products were rinsed with n-heptane and dried. Results indicated that chemical structure was the chief determinant of polymerizational effectiveness. The chemical composition was characterized by carbonyl, carboxyl and hydroxyl groups containing oxygen, which apparently controlled the bond of fillers with titanium tetrachloride. Groups that inhibit polymerization were also present on the surfaces of the carbon fillers. Polyethylene compositions obtained by this method had high physicomachanical qualities of durability and conductivity. References 10: 9 Russian, 1 English.

[302-12131]

UDC 678.686.028

### STRENGTHENING EPOXY OLIGOMERS

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 82 pp 32-33

LABINSKAYA, N. V., SERDYUK, L. Ye., TROFIMENKO, N. F. and  
MOSHCHINSKAYA, N. K.

[Abstract] Earlier work on effective accelerators for strengthening epoxy oligomers led to fiberglass products for electrotechnical uses. The authors

studied methods for strengthening using acid anhydrides with new accelerators such as  $C_6H_5CH_2(C_2H_5)_3NCl \cdot 1.5ZnCl_2$  and  $C_6H_5CH_2(C_2H_5)_3NCl \cdot 1.5NaCl$ . The accelerators tested had varying effects depending on the epoxy oligomer being tested. For example, with all oligomers but "ED-20," the exothermal reaction began at 90°, while with ED-20 it began at 130°C. The least temperature increase came with the cycloaliphatic epoxy oligomer UP-632. Length of reaction also varied. Data of electrokinetic studies confirmed these results. Both methods enable determination of optimal composition of the material being hardened, the length and temperature of strengthening. The process was shortened for most epoxy oligomers by use of the test accelerators, while technical parameters were preserved. Figures 2; references 7 (Russian). [302-12131]



## RADIATION CHEMISTRY

UDC 621.639

### RADIOCHEMISTRY OF ATOMIC EXPLOSIONS

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 20 Dec 81) pp 277-286

KRIVOKHATSKIY, A. S.

[Abstract] Noting that agreements on underground nuclear explosions do not exclude ones conducted for peaceful purposes and citing other provisions of those agreements, the author reviews data collected from such blasts. He defines radiochemistry both in terms of radionuclides and their behavior and in terms of chemical transformations resulting from nuclear explosions in rocks, liquids and gases. Physicochemical aspects of each explosion must be monitored to protect the environment and control the products of a project. The latter includes acquisition and processing of radioactive materials to obtain synthetic isotopes and techniques for deactivizing other materials before their use. The use of atomic explosions in obtaining mineral ores through blasts which form macrocomponents of useful elements that could not otherwise be obtained is discussed. Geological structures, the migration of radionuclides with ground water and resultant leaching must be taken into account in such projects. Uses of analytical radiochemistry for dating and for environmental protection are summarized. Chemical processing of products of atomic explosions involves obtaining ores such as copper and uranium through underground leaching without disturbing agricultural lands. US and Soviet projects are cited. Other projects have been directed toward producing californium 252 or fermium 257 from natural uranium, at much lower costs, or producing electrical energy through use of  $^3\text{H}$  explosions (a US project). References 18: 15 Russian, 3 Western.  
[291-12131]

## EXTRACTING PENTAVALENT AMERICIUM FROM SOLUTIONS OF POTASSIUM PHOSPHOTUNGSTATE

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 15 Aug 81) pp 303-307

MOLOCHNIKOVA, N. P., FRENKEL', V. Ya., MYASOYEDOV, B. F. and  
LEBEDEV, I. A.

[Abstract] Study of extraction properties of Am(V) contributes to developing methods for extracting it from other actinoids. Previously the authors showed its extraction in quantity using 1-phenyl-3-methyl-4-benzoylpyrazolone-5 (PMBP) in isobutanol at pH=4.5-5.5, but this process also produced Am(III). The present study is devoted to extracting americium in various oxidation states, as well as other actinoids, from solutions containing potassium phosphotungstate, in order to develop methods for separating them. Methods for obtaining the necessary reagents and for carrying out the process are summarized. Ammonium persulfate, which is essential to stabilize Am at higher degrees of oxidation, did not affect complex formation of trivalent actinoids with heteropolyanions. Am(V) was extracted in quantity by a 0.05 mol/l solution of PMBP in isobutanol from solutions with pH=4.5-5.5, and the presence of heteropolytungstates did not affect Am(V) extraction. With heating, the solution produced Am(VI). The addition of an acetate buffer caused thinning but the Am(VI) remained. It was also possible to extract curium using this method. Figures 4; references 10: 9 Russian, 1 French.  
[291-12131]

UDC 546.799.3

## SEPARATING OXALATE AMERICIUM (V) COMPOUNDS FROM SOLUTION

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 20 Dec 81) pp 319-321

ZUBAREV, V. G. and KROT, N. N.

[Abstract] The reaction of Am(V) with oxalate ions has received little attention. The authors sought to obtain complex Am(V) oxalates in solid state using Am-243 isotopes with less than 30% Am-241. Different results were obtained when Am(V) was precipitated using ammonia, as the amount of ammonia correlated directly with the Am(V) concentration in the solution, and when KOH was used in a slightly acid Am(V) solution, as increasing the KOH content brought a decrease in Am(V) residual concentrations. Physical characteristics also changed with heating or clarification. Complex Am(V) oxalates were obtained by precipitation with hydroxides of the desired alkaline metal, obtaining, for example  $\text{CsAmO}_2\text{C}_2\text{O}_4 \cdot x\text{H}_2\text{O}$  and  $\text{KAmO}_2\text{C}_2\text{O}_4 \cdot x\text{H}_2\text{O}$ . Powder x-radiation showed that salts of Am(V) and Np(V) were non-isomorphic.

All the compounds produced decomposed readily in their own alpha-radiation. Compounds synthesized in the evening had transformed to carbonates of trivalent americium and the alkaline metal by morning. Figure 1; references 4 (Russian).  
[291-12131]

UDC 531.1:546.799.4:542.61

#### OXIDIZING PU(III) IN EMULSION OF 30% TRIBUTYLPHOSPHATE-AQUEOUS SOLUTION OF NITRIC ACID CONTAINING HYDRAZINE

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 20 Jun 81) pp 331-334

MARCHENKO, V. I., REVYAKIN, V. V., GITKOVICH, Ye. S. and KORABLEVA, N. A.

[Abstract] Previous studies with the title emulsion led the authors to test a wider range of experimental conditions to observe the behavior of trivalent plutonium. Tributylphosphate (TBP) in n-dodecane was mixed with an aqueous solution of nitric acid containing Pu(III) and hydrazine. At intervals aliquots of each phase were removed to determine Pu concentrations. Nitric acid concentrations in the organic phase were calculated on the basis of its concentration in the aqueous phase and the value of an  $\text{HNO}_3$  extraction constant. Results showed that significant oxidation of Pu(III) began at  $[\text{HNO}_3] \approx 1.5 \text{ mol/l}$  at  $32^\circ\text{C}$  and accelerated as acidity was increased. All tests showed a distribution of Pu(IV) that indicated non-reversible oxidation of Pu(III). Oxidizers of Pu(III) in a two-phase system can be nitric or nitrous acid or nitrogen oxides, as well as atmospheric oxygen. Tests using the title emulsion in a helium medium showed that Pu(III) oxidizes to a tetravalent state somewhat more slowly under these conditions than in normal air and, apparently, atmospheric oxygen does not play a determining role in the process. Thus, the oxidizer is the nitrous acid or nitrogen oxide present in TBP. Figures 4; references 3 (English).  
[291-12131]

UDC 546.799.3

#### PREPARING NEPTUNYL AND NEPTUNOYL URANATES

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 15 Apr 81) pp 343-350

CHAYKHORSKIY, A. A. and LEYKINA, E. V.

[Abstract] Attempting to obtain mixed actinoid salts, the authors sought to synthesize neptunyluranate directly by contact of  $\text{NpO}_2^{2+}$  and  $\text{UO}_4^{2-}$  in solution

without hydrolysis as they had previously synthesized uranyluranate (reported in Soviet patent 722041). The zone of hydrolysis of the neptunium and uranium salts was evaluated by determining the pH dependency on relative concentrations. Concurrently, they sought to obtain a neptunoyluranate compound. Procedures are described for obtaining  $\text{NpO}_2(\text{NO}_3)_2 \cdot n\text{H}_2\text{O}$  and analogous uranium salts,  $\text{NpO}_2\text{UO}_4 \cdot n\text{H}_2\text{O}$ , for recording absorption spectra and for studying reactions of  $\text{NpO}_2^+$  ions with potassium uranate. Attempted synthesis of neptunoyluranate failed. Results showed that there was a 1:1 ratio between  $\text{NpO}_2^+$  and  $\text{UO}_2^{2+}$  and the precipitate contained no potassium ions. The failed attempt to produce  $(\text{NpO}_2)_2\text{UO}_4 \cdot n\text{H}_2\text{O}$  showed that  $\text{NpO}_2^+$  ions catalyze the formation of  $\text{H}_2\text{UO}_4$  from  $\text{UO}_3$  and water and contribute to forming a supersaturated  $\text{H}_2\text{UO}_4$  solution, from which  $\text{H}_2\text{UO}_4(\text{UO}_3 \cdot \text{H}_2\text{O})$  precipitated overnight. Also, new absorption bands for  $\text{NpO}_2^+$  ions were found in the infrared area during the assessment of these experiments. Figures 6; references 8: 2 Russian, 6 Western.

[291-12131]

UDC 541.28:547.1'3

#### USING NUCLEAR CHEMICAL METHOD FOR SYNTHESIZING UNKNOWN ORGANIC ONIUM COMPOUNDS

Leningrad RADIOKHIMIYA in Russian Vol 24, No 3, May-Jun 82  
(manuscript received 28 Oct 81) pp 394-396

NEFEDOV, V. D., TOROPOVA, M. A., SHCHEPINA, N. Ye., AVRORIN, V. V. and ZHURAVLEV, V. Ye.

[Abstract] While considerable research has been done on organic onium derivatives, a number of compounds, including ones with halogens other than iodine, have not been produced. The authors applied the nuclear chemical method they previously proposed (Soviet patents) in synthesizing tetraphenylammonium and diphenylfluoronium compounds. The method involves directed ion-molecular reactions of tritium-treated phenyl cations obtained in the beta-decomposition of tritium in the framework of tritium-treated benzene with phenyl derivatives of the elements being studied. Ion-molecular reactions were conducted in sealed ampules containing the reactive mass of treated benzene (the phenyl-cation source), phenyl derivatives of nitrogen and fluorine as substrates, and salts of inorganic  $\text{KBF}_4$  or  $\text{KI}$ . Thin layer chromatography was used to identify the onium compounds obtained. Low yields in earlier tests of the derivative of tetraphenylammonium were apparently due to severe spatial difficulties; these difficulties were reduced in the present method by replacing phenyl groups with methyl groups, and much improved yields resulted. Evidence from chromatography confirms the identical molecular structures of the treated onium derivatives obtained and corresponding onium compounds of analogous phosphorus and bromine. References 10: 9 Russian, 1 English.

[291-12131]

RADIATION ELECTRICAL CONDUCTIVITY OF ORGANIC DIELECTRICS DURING PULSED  
GAMMA-NEUTRON RADIATION

Moscow PLASTICHESKIYE MASSY in Russian No 7, Jul 82 pp 20-22

MAKEYEV, S. N. and FILATOV, N. I.

[Abstract] The widespread use of solid organic dielectrics in atomic technology promotes the study of changes in electrophysical properties of isolation materials when affected by various types of radiation, including the title form, which has received little attention. Analysis of experimental and theoretical data show that temporary and permanent radiation damage occurs to electric and other parameters. The latter occur during constant radiation, but not during pulsed radiation. The authors studied the title conductivity of high and low pressure polyethylene, polycarbonate, polytetrafluoroethylene, polyethyleneterephthalate, polyacrylate DV, polyamide P-68 and other dielectrics. High pressure polyethylene results showed that radiation electrical conductivity did not depend on electrode material or the means of application. Experimental study of ionizational currents in dielectrics during pulsed radiation, in dependence on external voltage, where conducted at constant power of the absorbed radiation dose. Increasing the strength of the electrical field together pulsed radiation did not lead to penetration of film polymer dielectrics. Oscillogram analysis showed that radiation electrical conductivity under these conditions did not depend on the magnitude and polarity of external voltage. Absolute REC values for each dielectric depended on the ratio between gamma and neutron components, which is clarified by the contribution of the neutron component, and ranges from 86% for low-pressure polyethylene to only 4% for polyethyleneterephthalate. In neutron radiation, ionization is dependent on the effect of heavy charged particles. References 7; 5 Russian, 2 Western.

[302-12131]



UDC 678.744.32-139.01

EFFECT OF COMONOMER NATURE ON PROPERTIES OF ACRYLATE RUBBERS

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82  
(manuscript received 5 Nov 81) pp 4-6

SUVOROVA, E. A., FOMICHEVA, M. M. and GRINBLAT, M. P., All-Union  
Scientific Research Institute of Synthetic Rubbers imeni S. V. Lebedev

[Abstract] The behavior of resins based on butylacrylate rubbers depends on the nature of the second comonomer as well as on the type of the specially introduced monomer responsible for the vulcanization reaction. The authors studied acrylic acid nitrite (NAA) and ethoxyethylacrylate (EOEA) as a second comonomers. The vulcanizing system was potassium stearate combined with sulfur. With EOEA the time needed for achieving optimal resin properties was shortened greatly. The vulcanized rubbers had reduced durability during stretching and relative residual lengthening, improved elasticity at room temperature and a somewhat greater swelling tendency in isooctane-toluene compared to rubbers containing NAA. Depending of the nature of the reactive group responsible for vulcanization, durability and rebound increased for the resins at various temperatures. The effects of the two comonomers on the kinetics of vulcanized system formation was evaluated on the basis of changes in a balanced module at 100°C in relation to length of vulcanization. Results showed that the resin with EOEA had 24% greater changes than that with NAA. The resin with EOEA was judged to have less thermal resistance. Replacing NAA with EOEA in copolymers with butyl rubber should improve cold resistance and speed up vulcanization, due to increased thickness in the vulcanizing matrix when ethoxy groups are involved in the vulcanizing process. No variations were attributed to use of different reactive groups. Figures 4; references 5: 2 Russian, 3 Western.  
[292-12131]



## DETERMINING GLOBULAR FRACTION CONTENT IN FLUORORUBBERS

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82

(manuscript received 22 Jun 81) pp 6-7

YAKOVLEVA, T. V., DONTSOV, A. A., NOVITSKAYA, S. P. and BUKANOV, A. M.,  
Scientific Research Institute for Rubber Production

[Abstract] Soviet copolymers of vinylidene fluoride and fluororubbers have a durable supermolecular structure which, however, breaks down as a result of thermomechanical action. They contain a globular fraction and a random-structured fraction. The globules provide good durability as fillers, but reduce elasticity and hamper processing. Electron microscopy revealed that the globules were polydispersed and had diameters from 150 nm to 30-40 nm, depending on the precise systems examined. They were highly durable during storage and processing. Further studies showed that in acetone they swelled to 170 nm diameter. To separate them from non-globular particles, the authors employed an ultracentrifuge. The globular fraction could be separated only at speeds above 32,000 rpm. The SKF-26 copolymer was found to have the largest globular fraction, and SKF-32 had the smallest. Determining molecular mass features of fluororubbers required evaluation of the content of the globular fraction and the molecular mass difference of the random-structured portion; these are mutually supplementary parameters. Figures 2; references 6: 5 Russian 1 English.  
[292-12131]

UDC 678.06:621-762:533:6

## EFFECT OF TEMPERATURE OF AIR FLOW ON RESIN EROSION WEAR

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82

(manuscript received 9 Jun 81) pp 12-13

KHOROL'SKIY, M. S. and GORELIK, B. M., Far East Branch, Scientific Research  
Institute for Rubber Production; Scientific Research Institute for Rubber  
Production

[Abstract] In operation of rubber-metallic valves, the sealing element is subjected to erosion due to air flow and impact loads. The damage caused is related to temperature level. The authors studied this phenomenon at various flows, at temperatures from 22 to 100°C, on sets of 10 valves with initial zero clearance. The air flow came at a 90° angle for 180 sec. Results showed that deformation was caused either by increasing the temperature with constant air flow, or by increasing air flow at constant temperature. The greater the deformation of surfaces, the more significant the pressure of the air flow became in deforming the valve further. Reducing the hypothetical

module of compression and durability balance during stretching was not compensated by increased elasticity. Both surface damage and deeper pitting were observed. Figures 3; references 7 (Russian).  
[292-12131]

UDC 678.7-9

#### PROPERTIES OF MODIFIED RESINS WITH VARYING ZINC OXIDE CONTENT

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82  
(manuscript received 29 Oct 81) pp 14-16

SHVARTS, A. G., KOKOREVA, O. A., KNYAZEVA, L. A. and YEVSTRATOV, V. F.,  
All-Union Scientific Research Institute for Tire Production

[Abstract] Chemical modifiers used to obtain specific properties in resins frequently involve sulfur as a vulcanizing agent, an organic accelerator and a linking activator, which is often zinc oxide. The authors studied zinc oxide and the most common modifiers, ethylenethiourea, "RU", "PNDFA" and "GKhPK" [expansion unknown], and a combination of RU + GKhPK. Data showed that without a modifier, increasing zinc oxide content brought increased tension at 300% stretching and increased durability, and reduced relative lengthening. Introducing modifiers, particularly ethylenethiourea, brought high parameters even without zinc oxide. Increasing zinc oxide beyond the initial 2 parts by weight without fillers did not improve durability or tensile strength. The greatest difference was noted when 30 parts by weight of industrial carbon were introduced; this gave greater overall strengthening than 5 parts by weight of ZnO. Overall results indicated that adding "RU" as a modifier made it possible to reduce zinc oxide content in filled mixtures based on polyisoprene. Figures 3; references 11:

9 Russian, 2 Western.

[292-12131]

UDC 678.074.046.39

#### PROPERTIES OF RESINS FILLED WITH DOMESTIC PORTLAND CEMENTS AND CEMENT POWDER

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82  
(manuscript received 7 Apr 80) pp 16-17

SHIPINA, G. V., DEVIKINA, L. I., KRASOVSKIY, V. N. and GROMOVA, Ye. N.,  
Leningrad Technological Institute imeni Lensovet

[Abstract] The authors studied the effects of cement type on resin properties and the possibility of using cement powder as fillers for NK,

SKN-40 and SKS-30ARKP rubber resins. The highly alkaline cements used contain metal oxides and are active fillers and vulcanization activators. The test mixtures were vulcanized at 133 and 143°C. The cement fillers were seen to allow shorter vulcanizing time in direct relation to the cement quality, while the hypothetical balance module and the content of bound sulfur were the same as those when chalk or kaolin were used as fillers. The cement-filled resins were highly resistant to thermal aging, and other parameters equaled those when other fillers were used. Figure 1; references 3 (Russian). [292-12131]

UDC 678.063:539.217.5

#### EFFECT OF TEMPERATURE ON GAS PERMEABILITY OF GASKETS

Moscow KAUCHUK I REZINA in Russian No 7, Jul 82  
(manuscript received 22 Jul 81) pp 27-31

BARANOV, N. S., GIMAYEV, R. K., SOKOLOV, V. Ye. and YEL'KIN, A. I.,  
Moscow Order of Labor's Red Banner Engineering and Designing Institute  
imeni V. V. Kuybyshev

[Abstract] Since previous tests of gas permeability of polymeric materials had been conducted over narrow temperature ranges, the authors studied gas penetrability through joints sealed by rubber gaskets of various round and square shapes, at -50 to +120°C. Ethylstyrene rubber was vulcanized to the test cassettes. Magnitude of gas flow depended on such factors as gasket temperature, pressure of test helium, compression, and form, material and design of the cassette tested. Since design factors have been regarded as unrelated to gas permeability, temperature and pressure parameters were studied. Calculations showed the linear dependency of these parameters. At constant temperature, helium pressure was found to be unrelated to permeability. At reduced temperatures establishment of gas equilibrium on both sides of the gasket took as long as 4 days at -50°C. Temperature factors and their impact on permeability and diffusion can be used in designing various types of gaskets with varying compression for specific needs. Figures 7; references 9: 4 Russian, 2 Russian translations from English, 3 Western. [292-12131]

## WATER TREATMENT

UDC 668.8:628.543.34

### DECOLORIZATION OF EFFLUENT WATERS FROM PRODUCTION OF CATION AND DISPERSION DYES USING SODIUM HYPOCHLORITE

Moscow KHIMICHESKAYA PROMYSHLENNOST' in Russian No 6, Jun 82 pp 341-342

ENDYUS'KIN, P. N., DYUMAYEV, K. M. and BUYNova, N. I.

[Abstract] In the title program, study was made of the degrees of decoloring, and biochemical oxidizability, and content of active chlorine as a function of the temperature of the process used, pH level, oxidizer consumption and length of processing. Decolorization was conducted on daily samples from industrial collectors for a month, in an experimental device. With consumption of 3 g/l of active chlorine, the color index increases by an order of 2, apparently due to formation of dyes from amino-compounds. Increasing the oxidizer to 7 g/l brought oxidation of ammonium ions and of dyes and other organic compounds, reducing water coloration by 96.9%. Residual active chlorine content was 400 mg/l. These and other parameters indicate that the water could be forwarded to biological purification systems. The experimental method underwent successful production testing. References 3 (Russian). [288-12131]

UDC 628.32

### PURIFYING SEWAGE OF MERCURY

Kiev KHIMIYA I TEKHNologIYA VODY in Russian Vol 4, No 3, May-Jun 82 (manuscript received 29 Jun 81) pp 247-248

STRUKOV, F. I. and SVATIKOV, V. P., Voronezh Branch, All-Union Scientific Research Institute for Synthetic Rubber

[Abstract] While numerous foreign and Soviet patented processes are aimed at removing mercury from sewage by various physico-chemical means, they are complex, require elaborate equipment, and expend expensive reagents which are in short supply. The authors describe a simpler and more effective procedure based on heating waste water to 50°C and then processing it with

sodium polysulfides and iron chloride. Experimental data indicate that complete purification is achieved with use of 1.6-2 mg of polysulfides and 2-4 mg iron chloride, per mg of mercury when its concentration in sewage is 20 mg/l and with pH of medium is 6.5-7.0. References 23: 7 Russian, 1 Romanian, 15 Western.  
[287-12131]

UDC 628.547.16:35

#### CLEANING WATER RESERVOIRS OF INDUSTRIAL DISCHARGES FROM CHEMICAL FIBER MANUFACTURE

Kiev KHIMIYA I TEKHNLOGIYA VODY in Russian Vol 4, No 3, May-Jun 82  
(manuscript received 26 May 81) pp 249-252

ZAMELIN, V. I., Engineering and Construction Institute imeni V. P. Chkalov, Gor'kiy

[Abstract] The problem of effluent has accompanied expansion of chemical fiber production, which was nearly doubled during the past Five-Year Plan. Physico-chemical and biological purification procedures are widely employed; attempts have also been made to reduce water consumption in production, by such innovations as continuous polymerization and forming of filament in capron production, continuous lavsan production involving terephthalic acid and ethyleneglycol, etc. Research by the All-Union Institutes of Synthetic Fibers and of Water Supply, Water Systems, Hydrotechnical Installations and Hydrogeological Engineering has developed a flotation purification system which is described in this article. Combined with filtration, it yields water that is suitable for recycling in fiber production. Pilot chemical double purification at the Chernigov chemical fiber plant has had similar results. Procedures for recycling water from caprolactam fiber production and use of chemical mutagens such as nitrozomethylurea and dimethylsulfate to remove polyamide fiber residues and lubricants are also described. Figures 3; references 10 (Russian).  
[287-12131]



MISCELLANEOUS

UDC 547.568.1-39+547.538-39

SYNTHESIS OF ARALKYL HYDROXYDIPEROXIDES AND DIPEROXIDE MONOMERS BASED ON THEM

Leningrad ZHURNAL ORGANICHESKOY KHIMII in Russian Vol 18, No 6, Jun 82  
(manuscript received 5 Oct 81) pp 1209-1212

DIKIY, M. A., GEVUS', O. I. and PUCHIN, V. A., L'vov Polytechnical  
Institute

[Abstract] Hydroxyperoxides are an important type of functional peroxide capable of various chemical conversions at the hydroxyl group while preserving the O-O bond, thus permitting synthesis of other types of peroxides with required structures and properties. As a result of homolytic breakdown of the O-O bond they are capable of initiating free radical processes. The authors synthesized aralkyl diperoxides with a hydroxyl group and monomer derivatives of isopropenylbenzene. Hydroxydiperoxides were synthesized by the reaction of ketodiperoxides with methylmagnesium bromide. Unsaturated diperoxides were obtained by dehydration of the former through heating in an acetic acid solution in the presence of catalytic amounts of iodine. The monomers produced were not capable of radical homopolymerization, but could be stored for long periods. Structures were confirmed by reaction with hydroperoxide of tert.-pentyl, producing corresponding triperoxides, or by dihydroxylation with peracetic acid. Chemical procedures are given in the experimental section. References 6 (Russian).  
[284-12131]

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